Indiannica Learning
Knowledge beyond horizons

SMARTBYTE

A Course in Computer Science

Book 6

Bhavana Pandey

Series Editor
Abraham Tharakan

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Preface

Tell me and I forget. Teach me and I remember. Involve me and I learn.

— Benjamin Franklin

To enable children learn with ease, it's important to involve them and make learning enjoyable. Children nowadays are tech-savvy (or rather gadget-savvy). But at the same time, we need to also ensure that they become familiar with the know-how of the technology they use. **SmartByte**, a new course in computer science designed for classes 1 to 8, lets them learn the concepts behind the technology and apply them. To make learning more engaging, it seamlessly integrates other subjects with computer science. It has a learner-centric practice-oriented approach and includes latest developments in computer technology.

The course lays emphasis on the tools and their uses, which will help learners explore, comprehend, and apply the same. We decidedly deviated from the user-manual approach followed in most computer science books. The course covers open-source software programs, such as Tux Paint, Scratch, Python, GIMP, and Synfig, to provide children ample scope to experiment with computer programs.

The salient features of the course are as follows:

- **Remember**—a simple fact that learners should remember
- **Quick Tip**—an alternative or short method to do an activity
- **Did You Know**—an additional piece of information related to a topic
- **Check Point**—in-text questions to assess the learner's understanding
- **Quick Learn**—a short activity linking a concept to its application
- **Key Terms**—list of important terms
- **Project**—activities to encourage application of the concepts in real-life situations and link computer science to other subjects
- **Lab Activity**—activities to enhance learning by doing
- **Explore More**—gives learners opportunities to go beyond the textbook
- **Notes for the Teacher**—useful tips for the teacher

The course is supplemented with comprehensive **teacher's manuals**, which include teaching aids, to facilitate classroom transactions. Further, an easy-to-use **learning app** provides support material to learners and gives them instant access to learning and assessment resources.

I sincerely hope the course will help children assimilate the concepts with ease and make learning of computer science enjoyable.

—Bhavana Pandey

Key Features

A useful, simple fact that learners should remember

Remember

A program written in a programming language is called source code. The translated machine-language program is called object code.

Did You Know?

Describing an algorithm using an informal way that does not require any programming language syntax is called pseudocode.

An additional piece of information related to a topic

An alternative or short method to do an activity

Quick Learn

Open the Script mode and display your name using the print command. Also, save the program on your desktop.

A short activity linking a concept to its application

Quick Tip

If you want to draw straight lines with the Pencil (or any of several other paint tools), click at the starting point, then hold down the Shift key, and click at the ending point.

Checkpoint

Answer the following questions.

1. You are a programmer. Which language will you prefer to write a program?
2. What do you mean by 'machine code'?
3. What was the need for translator programs?
4. Programs written in low-level languages need no translators. Then why do we need high-level languages, which require translators?
5. Which language is more hardware dependent—assembly language or high-level language? Explain how.

In-text questions to assess learners' understanding

Key Terms

Data Sorting	Arrangement of the given data according to a particular field, either in ascending or descending order
Data Filtering	A quick and easy way to find and work with a subset of data that meets specific criteria
Custom Filtering	To apply multiple conditions to filter data
Conditional Formatting	Applying formatting based on the conditions given by the user

List of important terms

Application-based Questions

1. Neha has added a video clip to her presentation, and she wants to do the following tasks:
   i) Play the video continuously till she stops it on her own
   ii) Start the video automatically
   Help her in doing the tasks, and write the options she should use in each case.

Assignments to check the application of the concepts taught

Lab Activity

1. Create a presentation on global climate change. Collect data and add charts to show climate change in India over the past few years.
2. Create a presentation on the digestive system. Add animation and transition effects wherever possible. You can also add your recorded voice to the slide to explain the function of each part.

Enhances learning by doing

Project

1. Think about how computer languages evolved. Discuss in class.
2. You visited a bank with your uncle. He deposited some money in his account. Write an algorithm, and then draw a flow chart representing the steps followed. Write the input, processing, and output in these steps.
3. Write an algorithm to create the sieve of Eratosthenes.
   (The sieve of Eratosthenes is a method of finding prime and composite numbers from 1 to 100.)

Encourages application of concepts in real-life situations and links computer science with other subjects

Useful tips for the teacher

Notes for the Teacher

- Help students to try out the different ways to copy and move data.
- Demonstrate all the methods to select cells, rows, and columns.
- Discuss the use of the Flash Fill and Auto Fill features. Describe how these are useful in saving time and effort.
- Format the worksheet properly. Do not use too many formatting features.

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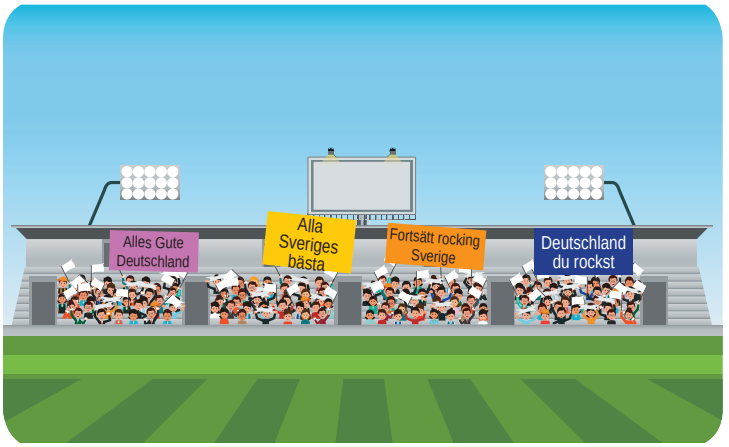
1 Computer Languages

After going through this chapter, you will be able to—

- **differentiate** between low-level and high-level computer languages;
- **write** basic algorithms; and
- **draw** flow charts.

It is Sunday, and Ojas is quite excited about the FIFA World Cup. He has completed his homework, and he is ready to watch the match between Germany and Sweden with his family.

The World Cup telecast begins. The stadium is packed with the audience. Everyone is cheering for their favourite team. People are holding placards with the slogans supporting their teams. They have written the slogans in their native languages. We read and write in the languages we understand.



Need for Programming Languages

It is Monday, and Ojas is sitting in the computer class. The teacher, Ms Meenakshi Arora, is introducing the class to computer languages. She begins the class by telling the children that a computer understands only the language that consists of 0s and 1s.

Ms Arora emphasizes that a programming language has instructions that are given to a computer to carry out a task.

Did You Know?

A set of instructions given to a computer to do a task is known as a program.

Ms Arora tells the class that there are many programming languages, which are broadly grouped as low-level and high-level languages.

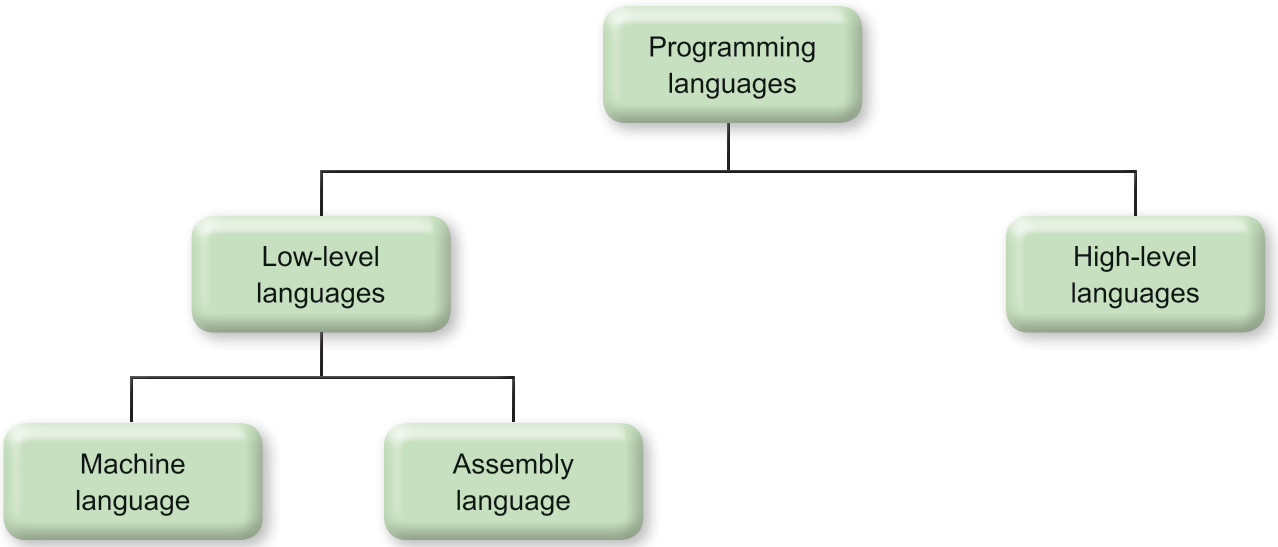


Fig. 1.1 Categories of programming languages

Low-level Languages

Ms Arora explains that low-level languages deal with the computer's hardware components. The programs written in low-level languages need no translation and are directly executed by the CPU. Thus, these are also known as machine-oriented languages.

The teacher tells the class that there are two types of low-level languages—machine language and assembly language. Ojas is writing all the important points on these languages on his exercise book.

Machine Language

In machine language, a program is written using the sequences of bits—0s and 1s. This is the only language that is understood by a computer. The instructions written in machine language are directly understood by the CPU. Thus, the programs written in machine language are executed very fast. However, writing programs in machine language is complex and time-consuming.

Ojas then lists down the advantages and disadvantages of machine language.

Remember

A computer understands the instructions only in the form of 0s and 1s.

Advantages of Machine Language

- The machine language programs need no translation and can be executed directly by the CPU.
- The programs are executed very fast.

Disadvantages of Machine Language

- The programs written in machine language are hardware dependent and run on only the machine for which they have been developed. Thus, these programs cannot be transferred from one computer to another, which means that these are not portable.
- It is very difficult to write a program in machine language. To write a program in machine language, a programmer must have a complete knowledge of the computer hardware for which he or she is coding.
- As programs written in machine language involve sequences of 0s and 1s, it is very difficult to find and fix errors in these programs. The process of finding and fixing errors is known as debugging.

Assembly Language

Assembly language was introduced to help programmers write commands in a language much closer to natural language—English, to be specific. It is written using specific words, known as mnemonics. For example, MOV is used for the command to move data, ADD is used for addition, and SUB is used for subtraction.

Assembly-language programs are not directly understood by the computers. So, they must be first converted into a machine code. An assembler, a specialized program, is required to convert an assembly code to a machine code.

Remember

A program written in a programming language is called source code. The translated machine-language program is called object code.

Advantages of Assembly Language

- Assembly-language programs are closer to human languages than machines.
- These programs are easier to write than machine code.

```
mov    [handle], eax
push   dword 0
push   written
push   dword 12
push   msg
push   dword [handle]
push   dword -10
call   _GetStdHandle@2
```

Fig. 1.2 Commands written in assembly language

Disadvantages of Assembly Language

- It may take a lot of time to write the programs as these are complex in nature.
- It is very difficult to rectify errors.

High-level Languages (HLL)

Now Ms Arora begins explaining high-level languages. She tells the class that a high-level language enables programmers to write programs using English language words and mathematical symbols.

'As high-level languages are closer to human languages than machine languages, they are easy to learn and write programs in,' explains Ms Arora.

She quotes C, C++, and Java as some examples of high-level languages.

Ms Arora then emphasizes the need for converting a program written in a high-level language to a machine code. She tells the class that this is done using a translator program and there are two types of translator programs—compilers and interpreters.

Did You Know?

- Machine language is called a first-generation language.
- Assembly language is called a second-generation language.
- High-level language is called a third-generation language.

Ms Arora now lists the advantages and disadvantages of high-level languages.

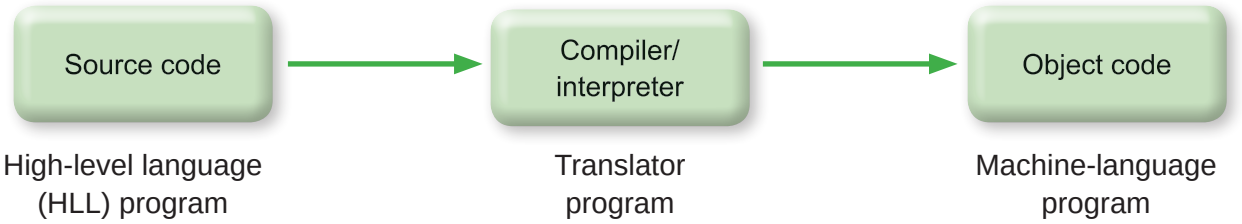


Fig. 1.3 Converting an HLL program to a machine-language program

Advantages of High-level Languages

- The programs written in high-level languages are easy to read, write, and modify.
- They are easier to maintain as compared to the programs written in low-level languages.
- They are machine-independent and portable.

Disadvantages of High-level Languages

- The programs written in high-level languages are slower than the programs written in low-level languages.
- They cannot communicate directly with the hardware of a computer.

Translator Programs

Ms Arora now asks students what 'translation' is. Ojas replies, 'translation means to convert text from one language to another.' Appreciating Ojas, the teacher now explains to the class about translator programs as described below.

When two people do not understand each other's language, they cannot communicate. They need a third person, a translator, to help them understand each other's language. Computers also need language translators. Language translators are the software programs that are required to convert a program written in a given language to another language. Typically, a translator program is used to convert a program written in a second or third generation language into a machine language code.

Assembler

An assembly-language program cannot be executed directly by the CPU. It needs a translator program that translates the assembly-language program into machine language. This translator is known as an **assembler**.

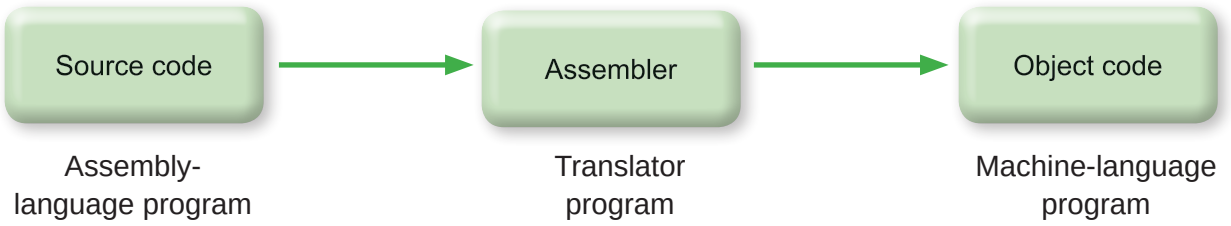


Fig. 1.4 Conversion of an assembly-language program to a machine-language program

Compiler

A compiler is a software program that converts a high-level language program into a machine-language program. It reads and converts the entire program in one go and then shows a list of errors. Once all the errors are rectified, the output of the program is generated.

Interpreter

An interpreter also converts a high-level language program into a machine-language program. It interprets and converts a program line by line. If there is any error, it shows the error on the screen and stops the execution. Once the error is rectified, it then moves to the next line.

Programs that use an interpreter are slower than those that use compilers. This is because the interpreter has to be used every time the program is run. Whereas, where a compiler is used, the program is translated into the machine code once, and that machine code can be used multiple times without having to use the compiler again.

Translators can execute the programs only if they are free of syntax errors. Syntax errors are the errors related to misspelled keywords, missing brackets, incorrect use of punctuations, and missing parentheses. A mistake in the logic used in the program code, which results in producing a different output from what is desired, is called a logical error. A translator cannot identify the logic used in the program. It will convert the program even if it has a logical error.

Fourth-generation Languages (4GLs)

Ms Arora explains that computer languages have evolved over time. She tells the class that a third-generation language requires a considerable amount of programming knowledge. Thus, a language closer

to human language that use words and phrases from the English language was developed. It is known as a fourth-generation language.

'Can anyone write programs in these languages as these use the words and phrases from the English languages?' asks Ravinder.

Ms Arora then explains that people can write programs in fourth-generation languages without requiring extensive programming skills. These languages are easy to use. The execution of programs written in 4GLs is very fast, and the programs are machine independent. They reduce the effort and time to develop software. She mentions SQL (structured query language) and PROLOG as some examples of 4GLs.

Checkpoint

Answer the following questions.

1. You are a programmer. Which language will you prefer to write a program?
2. What do you mean by 'machine code'?
3. What was the need for translator programs?
4. Programs written in low-level languages need no translators. Then why do we need high-level languages, which require translators?
5. Which language is more hardware dependent—assembly language or high-level language? Explain how.

Algorithms

Ojas got the result of his first-term exams. He scored 91 marks in English. Later, his English teacher told the class that all the students performed very well in English. The average maximum marks of the class in English was 89. Ojas knows that the average of a set of numbers is calculated by adding up all the numbers and dividing the sum by the number of numbers that were added up. For example, to get the average of two numbers, you must add the two numbers, and then divide the sum by 2.

But Ms Arora represents it in a different way:

- Start
- Take two numbers, say A and B
- Calculate their sum, A + B, and store it in Sum
- Divide Sum by 2 and store it in Avg
- Display Avg
- Stop

She then tells the class that this kind of set of step-by-step instructions to be followed for solving a problem is known

Did You Know?

Describing an algorithm using an informal way that does not require any programming language syntax is called pseudocode.

as an algorithm. She emphasizes that algorithms help us write programs and it is easy to write a program if we have an algorithm.

Example 1: Write an algorithm to calculate the square of a given number.

- Start
- Take the given number as A
- Multiply the number with itself, A* A, and store it in B
- Display B
- Stop

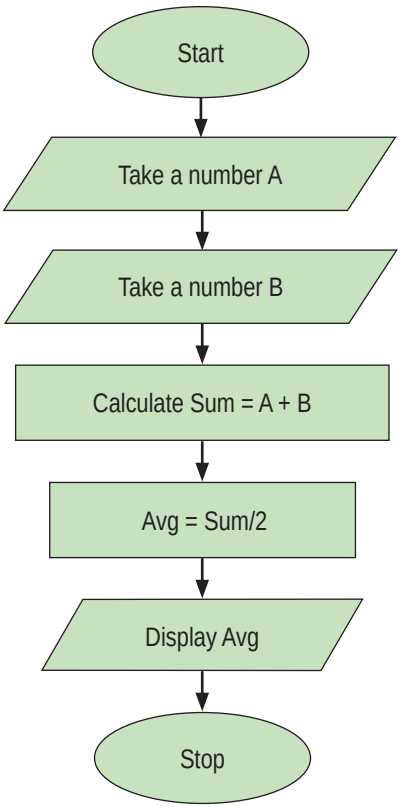
Quick Learn

Write an algorithm to find and display simple interest.

Flow Charts

Ojas has created a PowerPoint presentation showing the steps to calculate the average of two numbers. He shows his presentation to his elder sister. His sister tells him another interesting thing. She creates a new slide in his presentation showing a diagram as given below.

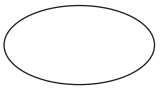
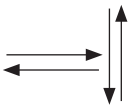
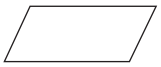
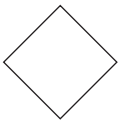
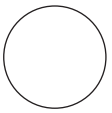
She tells him that this is a **flow chart**, which is a graphical representation of an algorithm. She further tells him that a flow chart gives us a better visualization of the solution. Thus, it helps us in understanding the logic of a program. She further adds that a flow chart can easily be converted into a high-level language program.



Symbols Used in a Flow Chart

She explained Ojas about the symbols used in the flow chart with their meanings as described below.

The symbols used in a flow chart are called the building blocks.

- Oval  It is used to mark the start and end of a flow chart.
- Flow line  It is used to show the flow of data in a flow chart.
- Parallelogram  It is used to display the input and output of a program.
- Diamond  It is used to represent a comparison and take decisions according to the specified condition. It will always have one flow line coming in, and two going out.
- Circle  It is used to connect a part of one flow chart to another. It is called a connector.
- Rectangle It is used to display the processing done.

Rules for Making a Flow Chart

'Ojas, there are some important points that you have to keep in mind while making a flow chart,' says his sister.

'What are those?' asks Ojas.

She then lists down some of the important points on his exercise book.

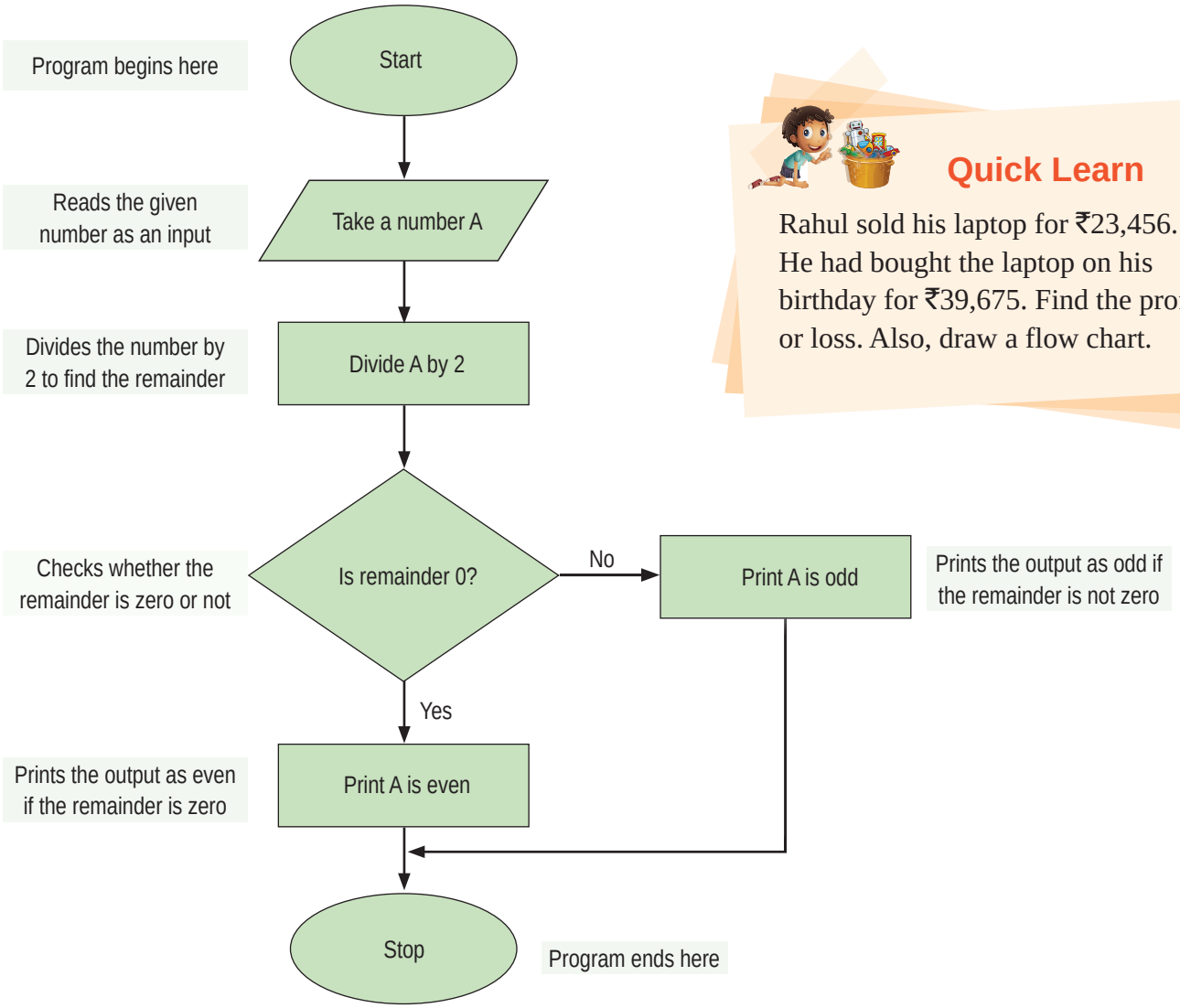
- A flow chart must begin with a start box.
- All the requirements and tasks should be listed out in a logical order.
- A flow chart must produce at least one result.
- All the boxes in a flow chart must be connected with flow lines.
- It generally flows from top to bottom.
- Only one arrow should come out of the processing box.
- Only one arrow should enter the decision box.
- Two or more arrows should come out of the decision box.
- If a flow chart moves from one page to another, a connector must be used.
- A flow chart must end with a stop or an end box.

Quick Learn

Draw a flow chart to find the difference between and product of the numbers 68 and 32.

'Now consider the following problem and let us draw a flow chart for its solution,' says his sister.

Problem: To find whether a given number is even or odd


Program begins here
Start
Reads the given number as an input
Take a number A
Divides the number by 2 to find the remainder
Divide A by 2
Checks whether the remainder is zero or not
Is remainder 0?
No
Print A is odd
Prints the output as odd if the remainder is not zero
Yes
Prints the output as even if the remainder is zero
Print A is even
Stop
Program ends here

Quick Learn

Rahul sold his laptop for ₹23,456. He had bought the laptop on his birthday for ₹39,675. Find the profit or loss. Also, draw a flow chart.

Key Terms

Machine language	The native language of a computer
Assembler	A software program that converts an assembly-language program to a machine language program
Compiler	A software program that converts a high-level language program to machine language program in one go
Interpreter	A software program that converts a high-level language program to machine language instruction by instruction
Algorithm	A systematic way of solving a problem
Flow chart	A graphical representation of an algorithm

Recap

- Computer languages are mainly categorized into two categories—low level and high level.
- A computer itself understands only machine language, which is represented by 0s and 1s.
- Assembly language is written using special codes, called mnemonics.
- Assembly language is converted to machine language using a software program, called assembler.
- High-level languages use the words from the English language and are closer to human languages than machine languages.
- Compilers and interpreters are used to convert high-level language programs to machine language programs.
- Algorithms and flow charts help us in understanding the logic of a program.

Exercise

A. Choose the correct options.

1. Which of the following languages do not require any conversion?
   a) Machine language b) Assembly language c) High-level language d) Java
2. Which shape is used to represent a decision in a flow chart?
   a) Rectangle b) Circle c) Diamond d) Parallelogram
3. What does a rectangle shape represent in a flow chart?
   a) Decision b) Input/output c) Start d) Processing
4. Which of the following languages uses mnemonics?
   a) Assembly language b) Machine language c) High-level language d) Java
5. Which of the following languages is an example of 4GLs?
   a) Java b) C c) SQL d) C++

B. State *true* or *false*.

1. Flow charts are a way to represent algorithms.
2. Assembly language consists of 0s and 1s.
3. C is a low-level language.
4. Machine language does not require any conversion.
5. High-level languages are faster than low-level languages.
6. An interpreter converts a low-level language program to a high-level language program.

C. Fill in the blanks.

1. _____ converts a high-level language program to a low-level language program in one go.
2. _____ and _____ are the two binary digits.
3. The two categories of low-level languages are _____ and _____.
4. You can use the _____ shape to represent the start and end in a flow chart.
5. A computer can only understand the _____ language.

D. Answer the following questions.

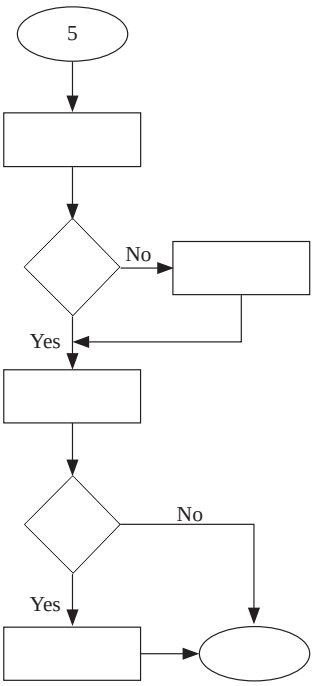
1. Briefly explain the types of low-level languages.
2. What is the difference between an assembler and a compiler?
3. Describe high-level languages with examples.
4. Why are low-level languages faster than high-level languages?
5. Write the features of fourth-generation languages.
6. Define an algorithm.
7. List the rules to be followed while creating a flow chart.
8. Draw a flow chart to do the following:
   a) Finding the square of a number
   b) Finding the smaller of two numbers

Application-based Questions

1. What type of software programs are language translators?
2. Given alongside is an empty flow chart, which gives the steps to be followed while booking a railway ticket online. The phrases given in the box on the right need to be filled in the boxes.

1.	Enter login id and password
2.	End
3.	Are tickets available?
4.	Are you a registered member?
5.	Start
6.	Register yourself
7.	Place order
8.	Enter website

Complete the flow chart by filling in the number inside each box. One has been done for you.



Lab Activity

1. Visit your computer lab, and find out which computer language is being used? Write the features of the language.
2. Write an algorithm, and draw a flow chart to find the greater of two numbers.
3. Write a flow chart to find the LCM of two numbers.
4. Swati bought a tablet on her birthday. The cost price of the tablet was ₹20,000. She did not like it and sold it for ₹16,000. Draw an algorithm and display the profit or loss.

Project

1. Think about how computer languages evolved. Discuss in class.
2. You visited a bank with your uncle. He deposited some money in his account. Write an algorithm, and then draw a flow chart representing the steps followed. Write the input, processing, and output in these steps.
3. Write an algorithm to create the sieve of Eratosthenes.
   (The sieve of Eratosthenes is a method of finding prime and composite numbers from 1 to 100.)

Explore More

- Find out what SQL is and where it is used.
- Explore the tools in MS Word that are used to draw flow charts.
- Search for some open-source flow chart software programs.

Weblinks

- https://www.informationq.com/computer-language-and-its-types/
- https://www.bbc.com/education/guides/z3bq7ty/revision/3

Work Wisely

- Never write a program that can lead to copying or gaining unauthorized access to other users' data.
- Always create an algorithm with clear steps. It helps programmers have a clear thought of what they want to implement.
- Always keep your flow chart finite and short. It helps programmers understand the logic and generate the program.

Notes for the Teacher

- Make sure that students are clear about the differences between low-level and high-level languages.
- Help them understand the importance of algorithms. Give examples of algorithms from their daily lives.

2 Operating Systems

After going through this chapter, you will be able to—

- **outline** the features and functions of an operating system;
- **compare** different types of operating systems; and
- **use** Windows 10 and discover its features.

Nidhi is collecting information on the major waterbodies of the earth. She knows that three-fourths of the earth's surface is covered with water. She also knows that there are four major oceans in the world, namely the Pacific, Atlantic, Indian, and Arctic oceans.

Nidhi starts writing about these waterbodies in MS Word. She does not forget to keep saving the file.

Just after writing the first two paragraphs, Nidhi starts drawing a picture of the Pacific Ocean in MS Paint. She also starts listening to her favourite songs on the computer.

Nidhi's elder brother, Nilesh, is observing her. He has a question for Nidhi, 'Do you know you are performing more than one task on the computer?'

'Yes, I am writing, drawing, and listening to songs,' Nidhi replies.

'But have you ever wondered how a computer handles more than one task?' Nilesh asks Nidhi.

Nidhi doesn't have the answer.

'It's the operating system,' Nilesh replies.

'Operating system … operating system. Our computer teacher told us today that we will learn about operating systems tomorrow,' says Nidhi.

Operating System

Next day, Nidhi is sitting in her computer lab. The class is going to learn about operating systems. Their computer teacher, Ms Vijayalakshmi Reddy, begins the class by explaining that an **operating system** is a software program that controls the operations of a computer and enables other programs to run on it. She tells the class that an operating system also provides the user with a medium, called interface, to interact with the computer.

Ms Reddy emphasizes, 'Without an operating system, the parts of a computer will not be able to communicate with one another. Also, the user will not be able to use the computer.'

She lists some popular operating systems, such as Windows, macOS, Linux, and UNIX. She also tells the class that nowadays, mobile phones are also capable of operating and performing tasks similar to computers. We can, therefore, consider these as portable computing devices. They also need operating systems. Android and iOS are the two most popular mobile operating systems for mobile devices.

Did You Know?

MS-DOS was Microsoft's first operating system.

Quick Learn

Visit your computer lab and find out which operating system is being used there.

She emphasizes the fact that different operating systems may function differently, but they achieve the same objectives—managing computer resources and providing a user-friendly experience.

Functions of an Operating System

Ms Reddy now goes on to explain that an operating system performs a number of functions as described below.

Interface Management

Ms Reddy reiterates that an operating system provides the user with a medium to interact with the computer. This medium is called an interface or a user interface. It provides the ability to give commands to a computer to perform various tasks.

She now introduces the class to two types of user interfaces—command line interface (CLI) and graphical user interface (GUI). She reinforces the following points:

- In CLI, the user has to type commands at the command prompt. The earlier operating systems, such as DOS (disk operating system) and UNIX, were based on CLI.
- In GUI, the user can instruct a computer to perform specific tasks by just selecting and clicking on graphics or icons. Modern operating systems, such as Microsoft's Windows and Apple's macOS, come with GUI.

In near future, we may have Voice and even Gestures as user interfaces. These already exist in a limited form today.

Device Management

Ms Reddy explains to the class that an important function of an operating system is to control all the internal and external devices attached to a computer.

The gist of her explanation as noted down by Nidhi is as follows:

A computer can be attached to various devices, such as a keyboard, mouse, monitor, printer, hard disk, CD-ROM, DVD-ROM, and pen drive. These devices are used to input data into a computer, to output data from a computer, and for storing data. An operating system communicates with these devices through their device drivers. A device driver is a software program that controls a particular device. An OS also decides when and for how long a processor needs a device.

Did You Know?

- When we turn on a computer, the first process that is initiated is booting.
- Booting is a set of operations that loads and starts the operating system. It then prepares the system for use.

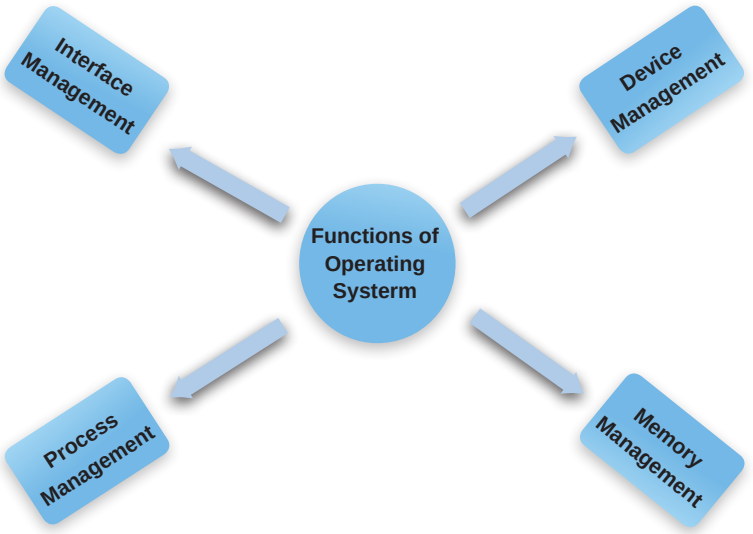


Fig. 2.1 Functions of an operating system

Process Management

Ms Reddy tells the class that today's computers allow us to carry out many tasks at the same time.

'Can you give me some examples when you were doing more than one task on a computer?' she asks the class.

Nidhi raises her hand and elaborates how once she was writing, drawing, and listening to her favourite music on the computer. Ms Reddy then tells the class that many a time, we also have a file downloading in the background.

Remember

A process is a program that is being executed or run.

She takes Nidhi's example and says that when the Paint program is started, it is considered a process by the operating system. A process, in other words, is a program that is being executed or run. Similarly, the program playing the music to which Nidhi was listening and the program downloading the file are called processes.

Ms Reddy reinforces the following points:

An operating system keeps track of the processor and the running processes. Operating systems need to provide enough processor time to each of the running processes so that they can run efficiently. It allocates the processor to all the running processes. It deallocates the processor when a process no longer needs it. It also 'time-shares' the processor so that multiple processes can run. It allows one process to use the processor for a while, then gives the processor to another process while the first process waits for its turn to come again.

Memory Management

She then tells the class that an operating system manages the main memory of the computer. But before that she explains the term 'memory' to the children as follows:

The memory of a computer is an area into which a program must be loaded from the hard disk before it can run. It is similar to how you first remember the steps needed to do something before you actually do it—the steps are loaded into your memory! The main memory (also known as random-access memory, or RAM) of a computer is a temporary memory. For a process to run, it must be first loaded into the main memory. If there are multiple programs to run, then each program needs enough memory to run successfully.

Ms Reddy now tells the class that an operating system makes sure that enough memory is allocated to each program so that it can run. It also deallocates memory from the programs that are no longer running.

She mentions providing networking capabilities and maintaining the security of the computer system as some other functions of an operating system.

Nidhi has now understood all the functions of an operating system.

Checkpoint

Answer the following questions.

1. Name a few operating systems that run on computers.
2. What is the need for an operating system?
3. Differentiate between CLI and GUI giving examples.
4. How does an operating system manage the main memory of a computer?

Operating Systems for PCs

Now it's time for the class to be introduced to different operating systems available for a personal computer. Ms Reddy lists Microsoft's Windows, Apple's macOS, and GNU's Linux as some of the most widely used operating systems. She then elaborates these operating systems one by one to make it clear for the class. But before that she tells the class that there are two types of operating systems, proprietary and open-source operating systems, and differentiates between the two:

Did You Know?

You can install and use more than one operating system on your computer. Replacing an OS with a new and more efficient version is known as **upgrading** in computer terminology.

Proprietary operating systems are the exclusive property of their developers or publishers. They cannot be copied or distributed. Open-source operating systems are the operating systems whose source code is available for modifications. These software are freely available.

Ms Reddy now discusses some commonly used operating systems.

Microsoft Windows

Windows is a series of proprietary operating systems developed by Microsoft. It has a graphical user interface (GUI). It is the most widely used operating system on personal computers (PCs). The first version of Windows, known as Windows 1.0, was released in 1985. Windows 95, Windows 98, Windows ME, Windows XP, Windows 7, Windows 8, and Windows 10 are the other versions of Windows operating system that subsequently followed.

macOS

It is a series of proprietary operating systems developed by Apple for Macintosh computers. Apple Inc., an American computer company, developed macOS for its Macintosh line of personal computers. The Macintosh started the operating systems based on graphical user interface (GUI), which the users found easy to use. The users could find it easy to move the mouse pointer to visually navigate rather than typing commands. Later, Microsoft Corporation adopted the Mac interface and developed the Windows OS based on GUI.

The latest version of macOS is Mojave.

Linux

Linux is an open-source operating system developed by Linus Torvalds in the early 1990s. There are several versions of Linux to choose from. Ubuntu, Linux Mint, and Dragora are some popular free distributions of Linux. It supports both the command-line interface (CLI) and the graphical user interface (GUI).

Remember

Proprietary software programs are the exclusive property of their developers or publishers. They cannot be copied or distributed.

Operating Systems for Mobile Phones

Now Ms Reddy elaborates on two of the widely used operating systems for mobile phones and tablets—Android and iOS.

Android

Android is one of the most widely used operating systems on mobile phones and tablets. It is maintained by the Open Handset Alliance, a group of companies led by Google. It supports a large number of applications (apps). The latest Android version is Android Pie.

Did You Know?

Launched in 2000, Symbian was the first modern mobile OS on a smartphone.

iOS

Owing to the increasing need for efficient operating for mobile devices, such as smartphones and tablets, Apple Inc. developed the operating system iOS for iPhones and iPads. iPhone smartphone has revolutionized the way mobiles were being used by us. Some of the interesting features of iOS are:

- iMessage, which allows conversations between any devices running iOS and
- iCloud, which allows users to store information on Apple's new cloud-computing service.

The latest version of this operating system is iOS 12.

Checkpoint

Answer the following questions.

1. Describe the evolution of Windows operating system with the help of a timeline.
2. How is a proprietary operating system different from an open-source operating system? Give two examples of each.
3. You have noticed many versions of Windows operating system. What is the need for new versions of an operating system.
4. Compare the features of different operating systems. List their strengths.

Nidhi is now familiar with different operating systems. She comes back from school. Her elder brother, Nilesh, is solving a puzzle on the computer.

Nidhi wants to know which operating system he is using.

Nilesh tells her that the computer is running on the Windows 10 operating system.

'I want to know more about this operating system,' Nidhi requests her brother.

Windows 10 Operating System

Nilesh tells Nidhi that Windows 10 is the latest addition to the Windows family of operating systems and it was released by Microsoft in July 2015.

'It is the first version of Windows that receives ongoing feature updates,' he tells Nidhi.

New Look Start Menu

'Look at that small button located at the bottom left corner of the desktop,' Nilesh tells Nidhi.

'This is called the Start button,' Nilesh says clicking on the button, 'It lets you open the Start menu.'

Nidhi notices that the Start menu has all the options to start applications and other programs. Nilesh tells her that in Windows 8, the Start menu was replaced by the Start screen, but now it is back in Windows 10. He also shows Nidhi how the Start menu is expanded to include tiles, which were a part of Windows 8 Start menu.

Fig. 2.2 Start menu in Windows 10

Task View

Nilesh then points to this button and tells Nidhi, 'This is the Task View button.'

He further explains to Nidhi that this button displays all the windows that are currently open.

Nidhi clicks on the **Task View** button. Nilesh tells her that she can also use the **Windows** and **Tab** keys together on the keyboard.

'You can then click on the window you want to switch to,' he tells Nidhi.

'That's interesting, it is so easy to switch to another opened window,' tells Nidhi.

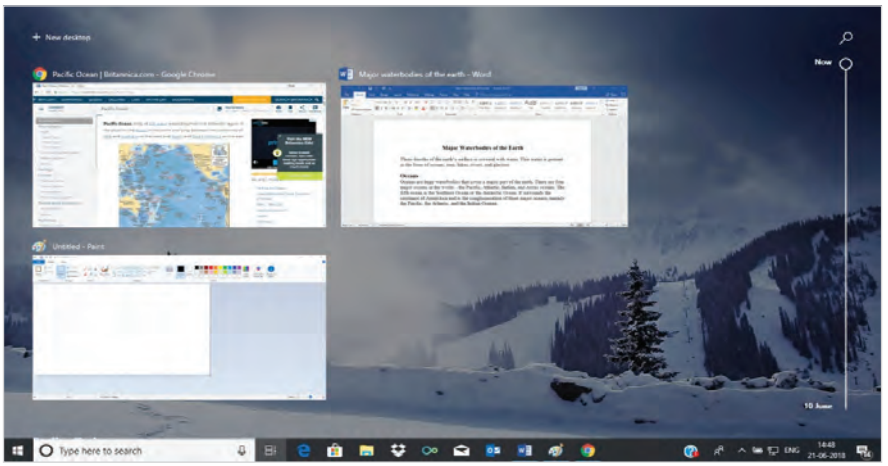


Fig. 2.3 Task View in Windows 10

Virtual Desktops

By now Nidhi has begun exploring Windows 10 and she is enjoying it.

'Let me also tell you one interesting feature of Windows 10—virtual desktop,' Nilesh tells her.

He opens the **Task View** and selects the **New desktop** button near the bottom-right corner. Nidhi notices more than one desktop on the screen.

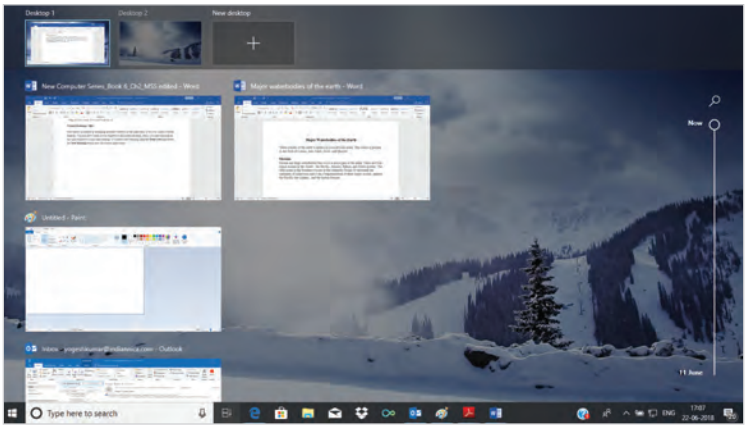


Fig. 2.4 Creating multiple desktops in Windows 10

After creating multiple desktops, Nilesh tells Nidhi that we can switch between the desktops. He also tells Nidhi that we can also move windows between desktops.

Quick Tip

Try these shortcuts:

- To quickly access the Task View: Windows key + Tab
- To create a new desktop: Windows key + Ctrl + D
- To delete a desktop: Windows key + Ctrl + F4
- To zoom between virtual desktops: Windows key + Ctrl + left or right arrow keys

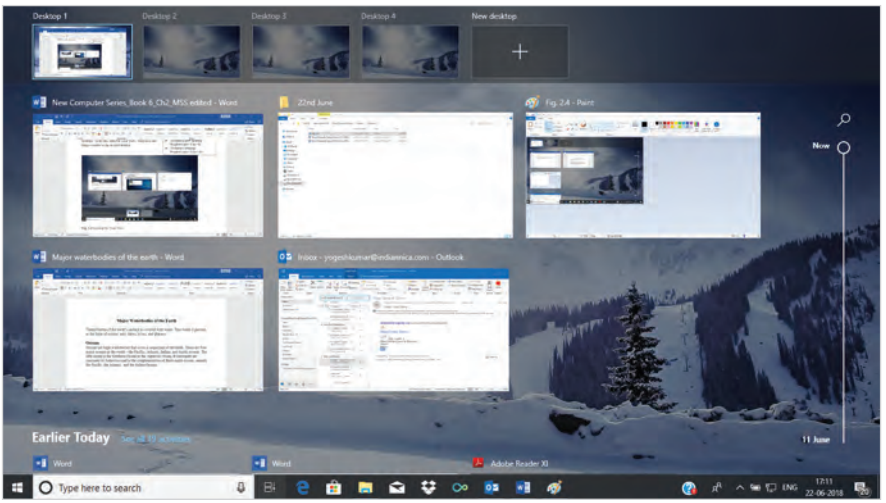


Fig. 2.5 Switching between multiple desktops

'Let me tell you how to close a virtual desktop,' says Nilesh. He opens the Task View. He then asks Nidhi to move the mouse over a desktop she wishes to close and click on the cross button × in the upper-right corner of the desktop.

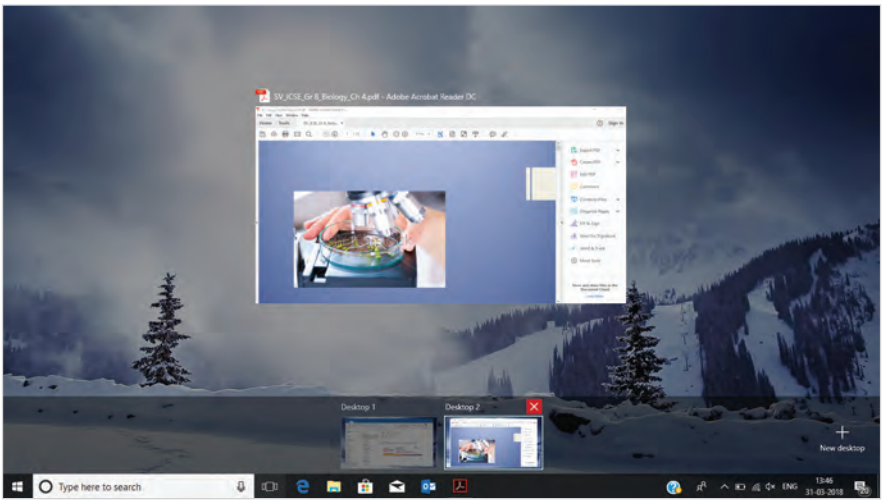


Fig. 2.6 Closing a virtual desktop

'It is quite an interesting feature,' says Nidhi.

Nidhi is now trying to create more virtual desktops. She uses one desktop to run her games, one more to open documents related to her school work, and yet another for email and browsing.

Microsoft Edge Browser

Nilesh now tells Nidhi that Windows 10 comes with a new faster, and more secure browser called **Microsoft Edge**. It replaces Internet Explorer as the default web browser.

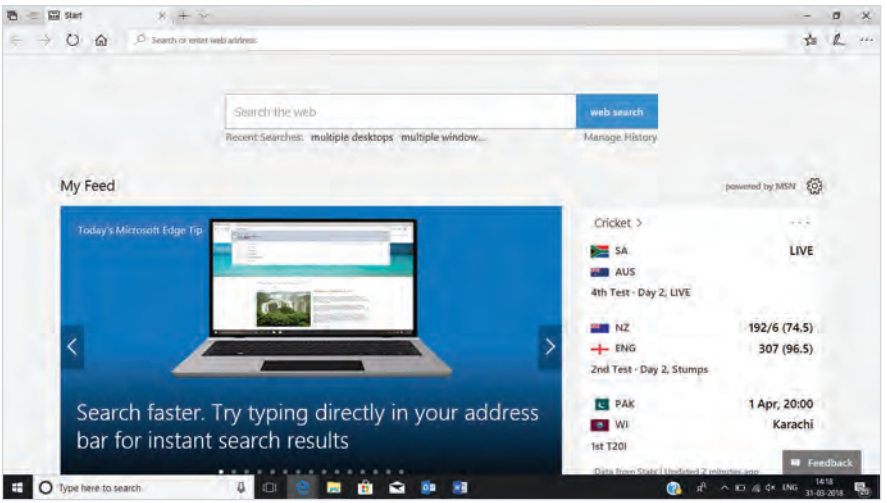


Fig. 2.7 Microsoft Edge browser

Cortana

While exploring the new features of Windows 10, Nidhi accidently clicks on the Microphone button located next to the Search bar. She notices that a menu appears that asks Nidhi to speak for what she wants to search. She says, 'What is the capital of Australia?' A few search results appear on the screen.

Nilesh then tells Nidhi that this is Microsoft's intelligent personal assistant, named Cortana. He tells Nidhi

that she can talk to this virtual assistant with the computer's microphone.

Nilesh tells her that Cortana can answer questions such as 'What's the weather like today?' and 'How many centimetres are there in a metre?'.

Nidhi is amazed, but what amazes her the most is the next thing Nilesh tells her:

'I can ask Cortana to remind you to complete your homework.'

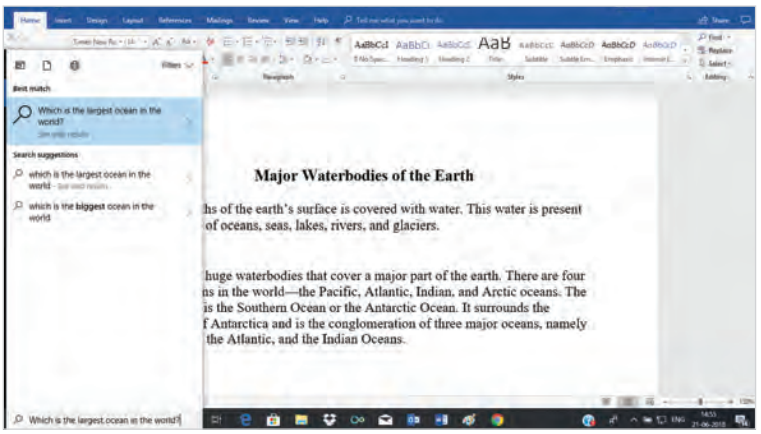

Major Waterbodies of the Earth
hs of the earth's surface is covered with water. This water is present
of oceans, seas, lakes, rivers, and glaciers.
huge waterbodies that cover a major part of the earth. There are four
ns in the world—the Pacific, Atlantic, Indian, and Arctic oceans. The
is the Southern Ocean or the Antarctic Ocean. It surrounds the
f Antarctica and is the conglomeration of three major oceans, namely
the Atlantic, and the Indian Oceans.

Fig. 2.8 Cortana: Microsoft's intelligent personal assistant

Quick Learn

Do the following tasks:

1. Open Word, PowerPoint, media player, and any game.
   Open the Task Pane.
   Add a new desktop.
   Move the media player and game to the new desktop.
   Create one more desktop.
   Move PowerPoint to the third desktop.
   Switch between different desktops.
   Delete the newly created desktop.
2. With the help of Cortana,
   - find different mobile operating systems and
   - set a reminder to save your work after five minutes.

Key Terms

Operating system	A software program that controls the operation of a computer and enables other programs to run on it
User interface	A medium through which a user interacts with a computer
Command-line interface (CLI)	An interface in which a user has to type the commands and data in the command prompt
Graphical user interface (GUI)	An interface in which a user can instruct a computer to perform specific tasks by just selecting and clicking on graphics or icons

Recap

- An operating system enables a user to interact with a computer.
- The functions of an operating system are interface management, process management, memory management, and device management.
- Every operating system has its own user interface through which a user can interact with a computer.
- User interfaces are of two types—command-line user interface (CLI) and graphical user interface (GUI).
- In CLI, a user has to type the command; while in GUI, a user has to click on images and graphics.
- The most widely used operating systems for PCs are Microsoft Windows, Apple macOS, and Linux. Android and iOS are some operating systems for mobile devices.
- Windows 10 is the latest version included in the Windows family. It includes new features, such as a new Start menu and multiple stage authentication.
- Mojave is the latest version included in the macOS family.

Exercise

A. Choose the correct options.

1. Who is the developer of Linux?
   a) Linus Torvalds b) John Smith c) Charles Babbage d) Albert Einstein
2. Which of the following is not an operating system?
   a) Linux b) Ubuntu c) Powershell d) Windows 7
3. What is the pane at the bottom of the screen in Windows called?
   a) View bar b) Taskbar c) Display bar d) Title bar
4. Which of the following developed macOS?
   a) Google b) Microsoft c) Amazon d) Apple
5. Which of the following is an open-source operating system?
   a) macOS b) Windows c) Mojave d) Linux

B. State *true* or *false*.

1. Android's primary developer is Google.
2. Android is an OS for smartphones.
3. An OS is responsible for allocating memory to processes.
4. To open the Task View, you can use the Windows and Ctrl keys together.
5. The disk operating system is based on CLI.

C. Fill in the blanks.

1. Without an _____, different parts of a computer cannot communicate with one another.
2. In _____ interface, the user has to type commands to give input.
3. The operating system that runs on iPad, iPhone, and iPod is called _____.
4. The term 'GUI' stands for _____.
5. The _____ OS uses both the CLI and GUI.

D. Answer the following questions.

1. What is an operating system? Mention any two operating systems.
2. Mention the salient features of the Windows 10 operating system.
3. Briefly explain the functions of an operating system.
4. Explain the multiple desktops feature of Windows 10.
5. What is Cortana in Windows 10?

Application-based Questions

1. Maahi is flaunting her new iPhone? Which operating system runs on her iPhone?
2. Ketan is very fond of playing games on his PlayStation? Does it have an operating system? If yes, then write the name of the OS.
3. Sonal is in the middle of a focused work session. She wants to open a Word file without disturbing the session. Which feature of Windows 10 will she use?

Lab Activity

1. Visit your computer lab. Find out which operating system is running by checking the user interface. (If it is macOS, check which version is being used by clicking on the Apple icon in the left-top corner of the screen.) Also, try out the features of the respective OS.
2. Write the configuration of the operating system being used in your computer lab.

Project

Compare any three operating systems on the basis of security, user interface, hardware compatibility, flexibility, price, and so on. You can do this in many ways, such as by creating charts, presentations, posters, and Venn diagrams. Be creative.

Explore More

- Conduct research on the Android operating system.
- Find out the steps to install an operating system on a computer.
- Find out the name of the first operating system.

Weblinks

- http://homepage.cs.uri.edu/faculty/wolfe/book/Readings/Reading07.htm
- https://medium.com/computing-technology-with-it-fundamentals/operating-system-its-functions-and-characteristics-c0946e4215c6

Notes for the Teacher

- Explain the concept of bootstrapping.
- Discuss the different operating systems and their uses.
- Explain the distinguishing features of Windows and macOS and Android and iOS.

3 Advanced Features of MS PowerPoint

After going through this chapter, you will be able to—

- **create**, **edit**, and **format** charts;
- **insert** audio and video files in a presentation;
- **add** animations and transitions; and
- **set** timings for each slide in a presentation using the Rehearsal feature.

Tandeep studies in class 6 in Acme Public School in Agra. It is Sunday. He and his mother are at home. She is working on her laptop and creating a PowerPoint presentation. She has to give presentation in front of the sales team in her office on Monday. Tandeep observes his mother making the presentation using MS PowerPoint. She is using charts, graphs, and tables to make her presentation interesting, attractive, and easy to understand.

Tandeep knows the basics of PowerPoint, but he doesn't know how to insert charts, audios, videos, animations, and transitions. In this chapter, you will see how Tandeep enjoys creating, editing, and formatting charts and his classmate Sneha enjoys inserting audio and video files and applying animation and transition effects in PowerPoint.

What is PowerPoint?

Microsoft PowerPoint is an application software that is used to make presentations. These presentations are made of several pages called **slides**. There are lots of slide layouts to choose from. You can add charts, graphs, tables, and other features to your presentation to make it more attractive. You can arrange these slides in any order and run them as a slide show. You can also take printouts of your presentation.

Did You Know?

PowerPoint was initially launched for Mac computers only.

After opening a new blank presentation, named, **Presentation1**, by default, you can add a new slide by going to the **Home** tab and selecting **New Slide**.

Adding a Chart

While his mother is having a cup of tea, Tandeep tells his mother that there was an interschool cricket tournament in Agra. He was part of a team that was keeping records of different kinds of data of all the matches.

He shows a table to her. The table shows the performances of the bowlers of a school in one of the matches of the tournament.

Bowlers	Overs Bowled	Runs Given	Wickets Taken
Amit	2	16	3
Sunil	2	10	1
Yogesh	2	12	2
Saurav	2	4	1

'Can I create a bar graph in PowerPoint?' Tandeep asks his mother.

'Yes, you can. But first let me tell you about various types of charts available in PowerPoint,' she replies.

She then provides the information on various purposes of different charts.

- Column chart is used to compare different items of data. For example, for comparing the heights of different students in a class, we will create a column chart.
- Line chart is used to track variations in data over short and long durations. For example, to show the variations in the sale of mangoes from starting of the summer to the end, we will use a line chart.
- Pie chart is used to compare different parts of a large part. For example, it can be used to compare a cricket score scored by a nation among different players.
- Bar graph is used to compare things of different groups or to track larger changes over time.

She asks Tandeep to open PowerPoint. He opens it and selects a blank presentation. He follows these steps then as told by his mother.

1. He goes to the **Insert** tab and searches for the **Chart** command and clicks on it.

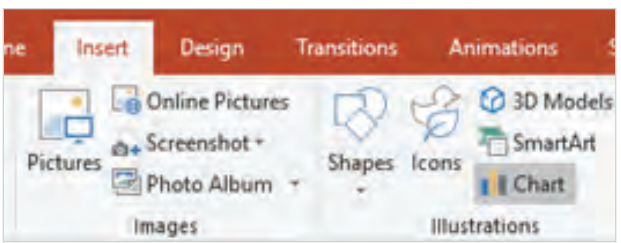


Fig. 3.1 Chart command

2. Tandeep's mother asks him to select the **Column** option from the left pane of the **Insert Chart** dialogue box. The right pane displays its preview. He is happy. It's the same kind of the chart that he wanted to create. He clicks on **OK**.

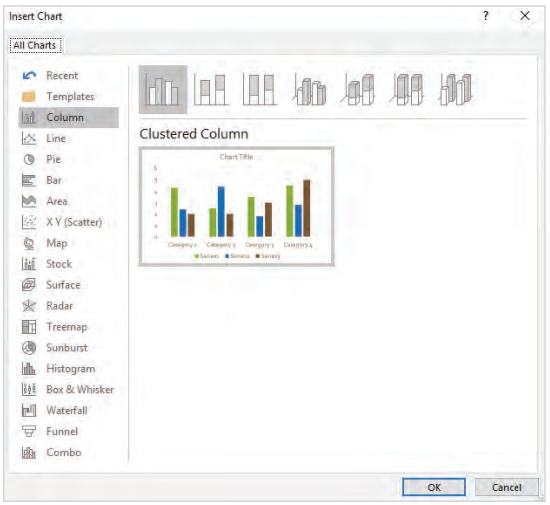


Fig. 3.2 Insert Chart dialogue box

Quick Tip

You can also insert a new chart by clicking on the Insert Chart command in the placeholder of a slide.

Remember

The Chart command lies in the Illustrations group under the Insert tab.

3. Tandeep finds a chart appearing with a spreadsheet. His mother asks him to enter the data into the spreadsheet. Tandeep fills in the data and gets a chart created based on it.

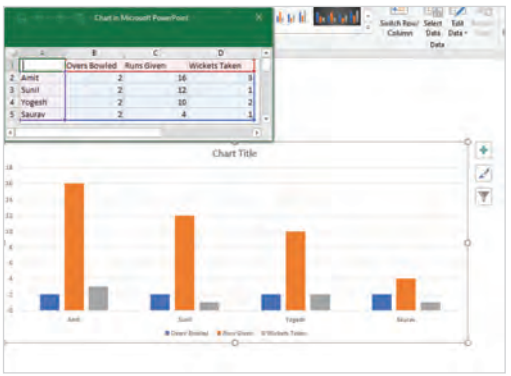


Fig. 3.3 Chart with a spreadsheet

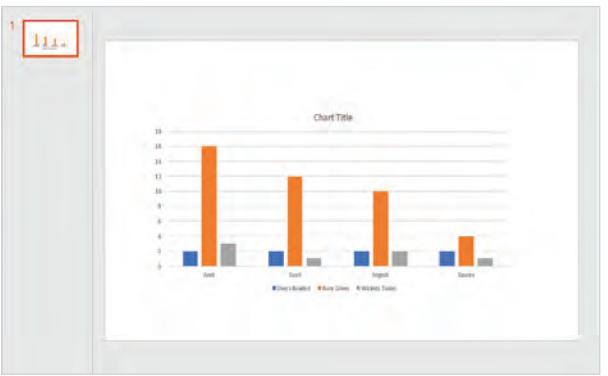


Fig. 3.4 Complete chart

4. Tandeep closes the spreadsheet. His chart is complete now.

Editing a Chart

While checking his chart, Tandeep notices that the data (Runs Given) of Sunil and Yogesh by mistake got interchanged. He immediately corrects his table. But at the same time, he needs the same correction to be done in the chart as well. His mother tells him that the data entered in a spreadsheet can be edited at any point of time. Changing the data in a spreadsheet will reflect the changes in the chart.

Quick Learn

Ask your classmates about their favourite games and list the data in a table. Create a chart showing the data in PowerPoint.

As advised by his mother, Tandeep starts editing the chart in this way:

1. This time, he clicks on the **Design** tab under the **Chart Tools** contextual tab.
2. He then searches for the **Edit Data** command and clicks on its down arrow. He then selects the **Edit Data** option.
3. The spreadsheet appears. Tandeep makes the desired changes in the spreadsheet and gets the edited chart.

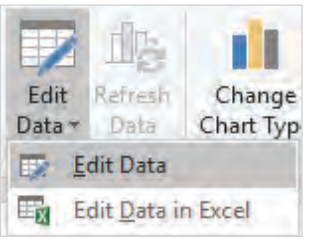


Fig. 3.5 Edit Data option

Changing the Chart Type

Tandeep learns from his mother that at any point of time he can change the chart type. For this, he should click on the **Change Chart Type** command in the **Type** group under the **Design** tab.

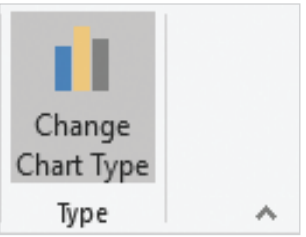


Fig. 3.6 Change Chart Type command

Formatting a Chart

Tandeep's mother tells him that there is one last thing that he is yet to try with his chart—the formatting. She explains to Tandeep that formatting makes a chart appear more attractive.

She tells Tandeep that there are various options to format a chart under the **Design** tab. He can select the style layout for his chart and select a colour theme.

Importing Data

Tandeep has written about the performance of the bowlers of Acme Public School in a Word document. He now wants to add this text to the chart created by him as a description. His mother tells him that he can import the content of a Word document or an Excel sheet into a presentation. She tells him that the **Object** command lets us import data from various other files into a presentation. She tells Tandeep to select the slide and click on the **Object** command in the **Text** group.

The **Insert Object** dialogue box opens up. There are two options:

- **Create new**—used to create a new file
- **Create from file**—used to select an already created file

Tandeep selects the **Create from file** option, and then clicks on the **Browse** option. He goes to the location where his file is saved and selects it.

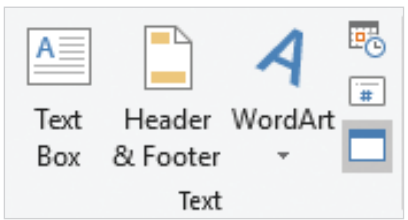


Fig. 3.7 Object command

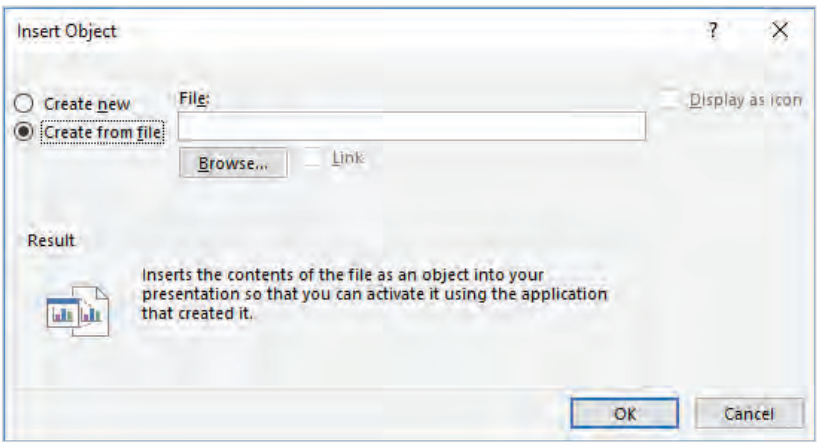


Fig. 3.8 Insert Object dialogue box

After clicking on **OK**, the data from the selected file gets imported into the presentation.

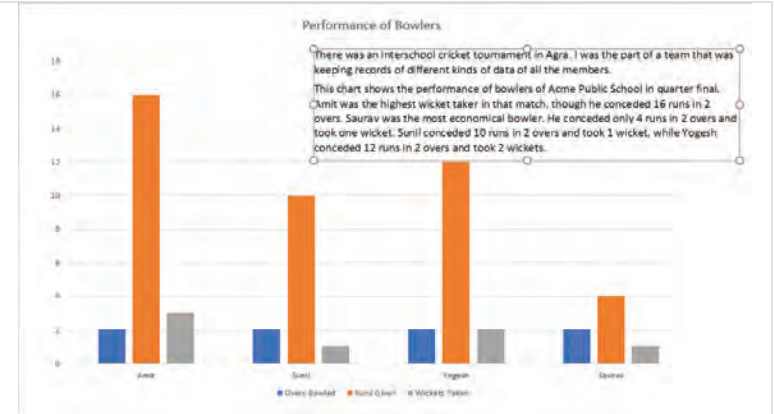

Performance of Bowlers
There was an interschool cricket tournament in Agra. I was the part of a team that was keeping records of different kinds of data of all the members.
This chart shows the performance of bowlers of Acme Public School in quarter final. Amit was the highest wicket taker in that match, though he conceded 16 runs in 2 overs. Saurav was the most economical bowler. He conceded only 4 runs in 2 overs and took one wicket. Sunil conceded 10 runs in 2 overs and took 1 wicket, while Yogesh conceded 12 runs in 2 overs and took 2 wickets.

Fig. 3.9 File imported into the presentation

The chart now looks better with the description added. Tandeep is happy. He has learnt how to create and edit a chart in PowerPoint, and how to add data to a slide from a Word document or an Excel sheet. He has understood that PowerPoint is an amazing tool to exhibit data in the form of charts.

Checkpoint

Choose the correct options.

1. Sujay wants to insert a chart in his PowerPoint presentation. Which tab contains the required option?
   a) Insert b) File c) Design d) Animation
2. Akriti created a chart in PowerPoint. She finds that the chart by default has only three columns. She wants to add two more columns. What can she do now?
   a) Make a new chart b) Add two new columns in the spreadsheet
   c) Make the chart in Paint d) None of these
3. Tandeep wants to show the bowling performance of Amit in the entire tournament. Which is the most appropriate type of chart that he should select?
   a) Column b) Line c) Pie d) Bar
4. Akanksha wants to format a chart that she has created in PowerPoint. She wants to show the values of every block. How can she do that?
   a) By changing the chart styles b) By inserting individual values
   c) By changing the chart type d) None of these

Applying Animation to an Object

A magnet attracts iron due to the influence of magnetic field upon the iron. Sneha, a classmate of Tandeep, has made a PowerPoint presentation to show how a magnet attracts a block of iron. She has named the presentation ‘Magnet attracts Iron’. Her uncle, who is a graphic designer, tells her that the presentation will look better if an animation is used.

He explains to her that we can animate or apply movement to any object or text on a slide. There are four types of animation effects:

Entrance—to control the entry of an object on a slide

Emphasis—to draw attention to an object

Exit—to control how an object leaves the slide

Motion paths—to manually define the movement of an object around the slide

Sneha's uncle asks her to open the PowerPoint presentation created by her. She then follows these steps:

1. She selects the image of the iron and clicks on the **Animations** tab.
2. She then locates the **Animation** group and clicks on the **More** drop-down button.
3. The drop-down menu offers different animation effects. She selects the **Lines** option as she wants to show the block moving in a straight line.
4. As Sneha wants to show the iron block moving towards the magnet, she chooses the **Left** option from the **Effect Options** drop-down menu. (By default, the motion effect is vertically downwards.)

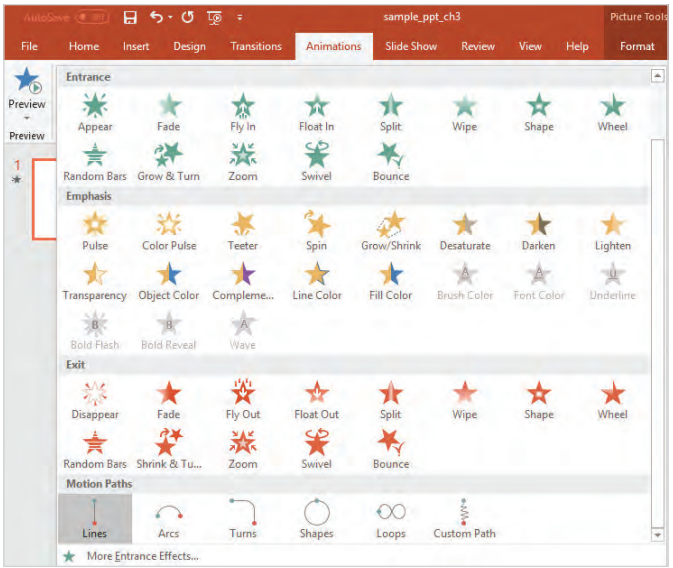


Fig. 3.10 Selecting an animation effect

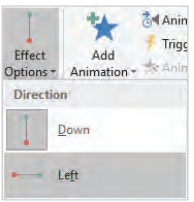


Fig. 3.11 Effect Options menu

The effect gets applied to that object and a number is displayed on the object.

Sneha's uncle now asks her to click on the **Preview** button to run the animation. He tells her that by default, the animation runs on clicking the mouse.

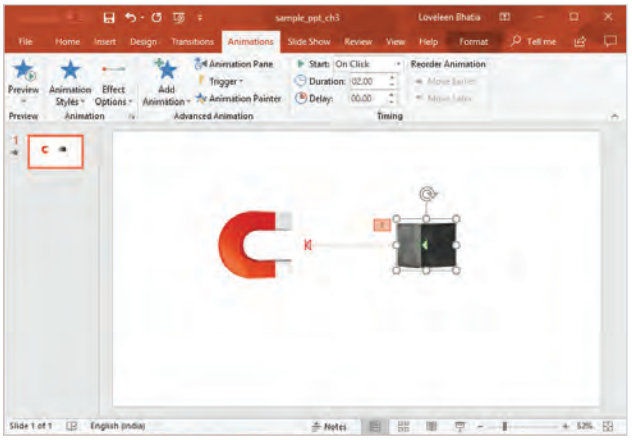


Fig. 3.12 Applying an animation effect

Quick Tip

To remove an animation effect, select the object and choose the None option by clicking on the More drop-down button in the Animation group.

Adding Multiple Animations to an Object

Sneha asks her uncle if she can add more than one animation effect on the iron block. He tells her that she should use the **Add Animation** command under the **Advanced Animation** group on the **Animations** tab. It provides a drop-down menu, from where she can select the desired animation effect.

The object then displays a different number for each effect applied.

Quick Learn

Insert a circle on a blank PowerPoint slide. Fill it with yellow and do the following:

1. Apply any Motion Path effect on it.
2. Apply the Bounce effect under the Exit category.

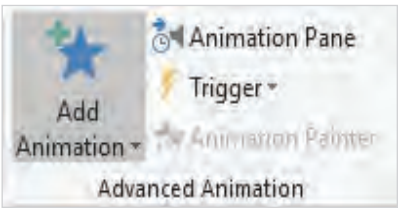


Fig. 3.13 Add Animation command

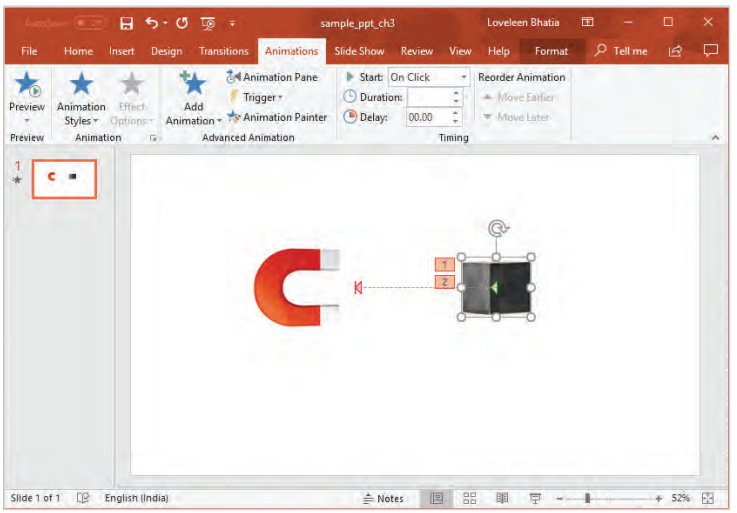


Fig. 3.14 Multiple animation effects

Changing the Timing and Order of an Animation

Sneha now learns how to change the timing and order of an animation from her uncle. He shows her the **Timing** group. He asks Sneha to click on the down-arrow of the **Start:** box. There she comes across three options—**On Click**, **With Previous**, and **After Previous**. Her uncle explains these options to her as follows:

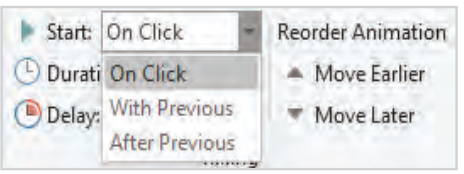


Fig. 3.15 Timing group

- **On Click**—begins the animation on clicking on the slide
- **With Previous**—starts the animation at the same time as the previous animation
- **After Previous**—begins the animation immediately after the previous animation effect (This also applies to the slide being loaded. The animation starts after the slide loads.)

Sneha notices two more options under the **Recorder Animation** command—**Move Earlier** and **Move Later**. Her uncle explains to her that these options change the order in which an animation plays.

Copying Animation

Sneha places one more image of iron in her slide. She wants to animate it too. Her uncle tells her that she can copy the same effect to this block of magnet as well. She follows these steps as advised by her uncle:

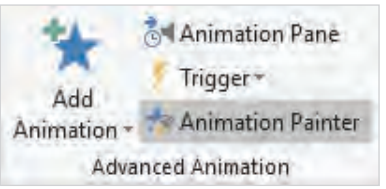


Fig. 3.16 Animation Painter command

1. She clicks on the object with animation effects that she wants to copy (here, the iron) and then searches for the **Animation Painter** command in the **Advanced Animation** group and clicks on it.
2. She notices that the mouse pointer has changed to a brush. She clicks on the second image of iron block. The animation effect gets copied.

Action Buttons

Sneha's uncle tells her one more interesting feature. He tells her that there are some built-in shapes that she can add to her presentation and use them as hyperlinks. These shapes are known as action buttons. When you click or hover over an action button, you can link a slide to this button or play a sound.

Inserting Action Buttons

Let us see how Sneha adds an action button to her presentation. She follows these steps:

1. She searches for the **Shapes** drop-down arrow button in the **Illustrations** group on the **Insert** tab and clicks on it. A menu showing all the action buttons appears.
2. She chooses the desired shape from the **Action Buttons** section.
3. Then she drags the mouse to draw the shape for the action button.
4. The **Action Settings** dialogue box appears. There are two tabs—**Mouse Click** and **Mouse Over**—on this box. Her uncle tells her about these tabs.
   - The **Mouse Click** tab is used to perform the action when the mouse is clicked.
   - The **Mouse Over** tab is used to perform the action when the mouse pointer is moved over the button.

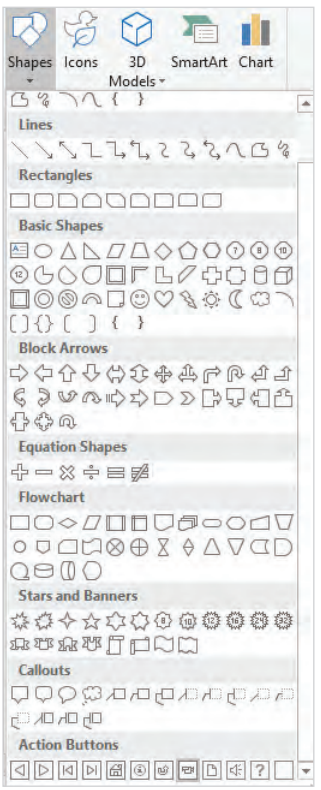


Fig. 3.17 Shapes drop-down menu

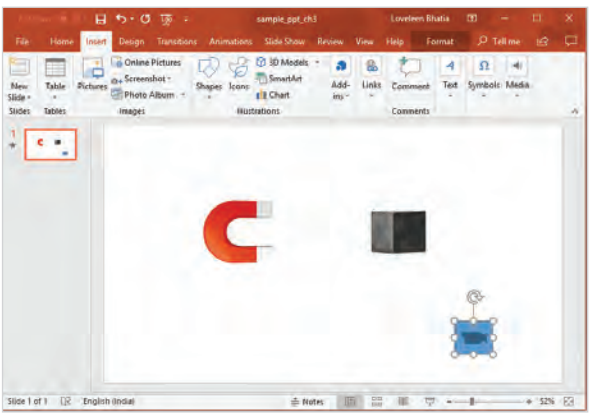


Fig. 3.18 Drawing the shape for the action button

5. As Sneha wants to perform the action on the click of the mouse, she selects the **Mouse Click** tab. There again she comes across four options. Her uncle explains the use of all four to her.

   a) **None** should be clicked if no action is to be performed.

   b) **Hyperlink to:** should be clicked to add a link to a web page, another document, or a previous concept/page of the same presentation.

   c) **Run program:** should be clicked to run a program on the action of the button.

   d) **Play sound:** should be clicked to play a sound when the action button is clicked on.

   Sneha clicks on the **Play sound** drop-down option and selects **Drum Roll**. She then clicks on **OK**.

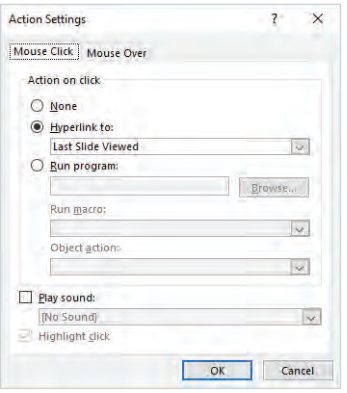


Fig 3.19 Action Settings dialogue box

Audio and Video in a Presentation

Sneha now wants to add audio and video clips to her presentation. This time, her elder brother, who studies in class 10, helps her. He asks her to locate the **Media** group under the **Insert** tab. She finds three commands there—**Video**, **Audio**, and **Screen Recording**.

Quick Learn

Aman wants to create a presentation on solar system. Help him do the following tasks:

1. Create a link on the second slide to the fourth slide.
2. Add a sound on the Action button.

Adding an Audio Clip

Sneha now wants to add the sound of the collision of the iron block with the magnet to her presentation. Her brother downloads an audio of the collision sound. He then guides Sneha through the following steps:

1. She clicks on the **Audio** drop-down button. There are two options—**Audio on My PC…** and **Record Audio**. She clicks on **Audio on My PC…** option.

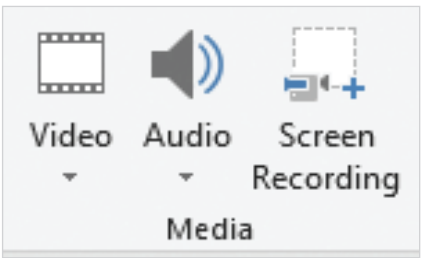


Fig. 3.20 Media group

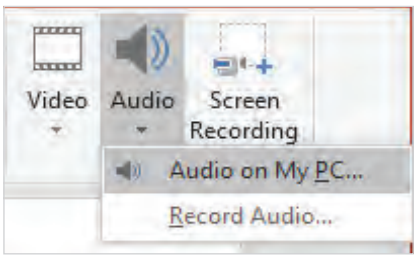


Fig. 3.21 Audio drop-down options

2. The **Insert Audio** dialogue box appears. Sneha chooses the location on her computer from where she wants to choose the audio file.

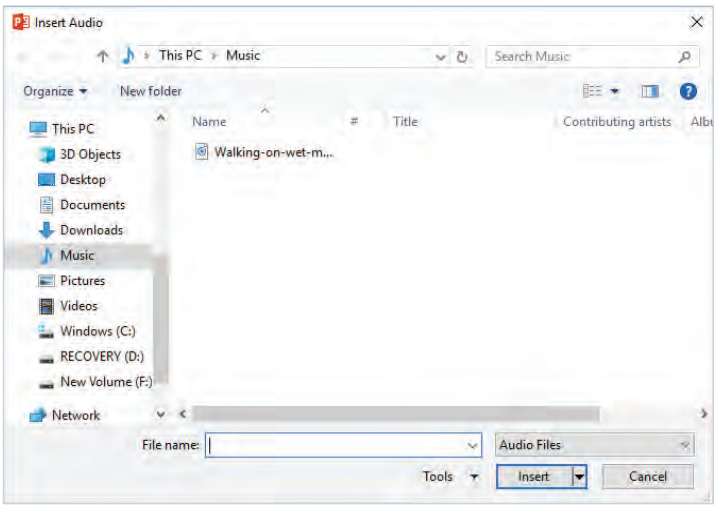


Fig. 3.22 Choosing an audio file

3. After selecting the file and clicking on **Insert**, the sound clip gets added to the presentation.

Fig. 3.23 Adding the audio file to the animation

Adding a Recorded Sound

Sneha comes up with a query for her brother.

'Can I insert my own voice in the presentation?' she asks.

'Yes, you can do so by using the **Record Audio** option,' he replies.

'I will help you,' he assures her.

Sneha is full of excitement now. She wants to record herself speaking about the popular story of the discovery of magnets. Here is how they record the voice.

Her brother clicks on the **Record Audio...** option, which opens the **Record Sound** dialogue box. He clicks on the **Record button** (red circle) and asks Sneha to start speaking. Sneha starts speaking about the story:

About 4000 years ago, there was an elderly Cretan shepherd, named Magnes, in Greece. Once he was herding his sheep in an area called Magnesia. He was standing on a large, black rock. Suddenly, both the nails in his shoes and the metal tip of his staff got firmly stuck to the rock. To find the source of attraction, Magnes dug up the earth and found lodestone beneath. Lodestones contain magnetite, a natural magnetic material. This type of rock was subsequently named magnetite, after either the name of the place Magnesia or Magnes himself.

When Sneha is done, her brother clicks on the **Stop** button. He then types the name 'Story of Magnets' for the audio file in the **Name:** text box and clicks on **OK**. The sound is inserted in the slide.

As a sound clip inserted in a slide, it is selected by default. Sneha's brother drags the sound icon to the desired location. Sneha plays and pauses the audio clip using the **Play/Pause** button. The timeline shows her the length of the audio and how much it has been played out. She uses the **Move Back** and **Move Forward** buttons to rewind and forward the audio.

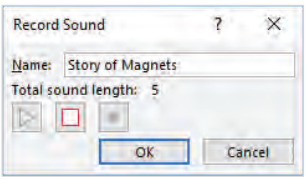


Fig. 3.24 Record Sound dialogue box

Fig. 3.25 Sound icon

Two new tabs, **Format** and **Playback**, appear under the **Audio Tools** contextual tab.

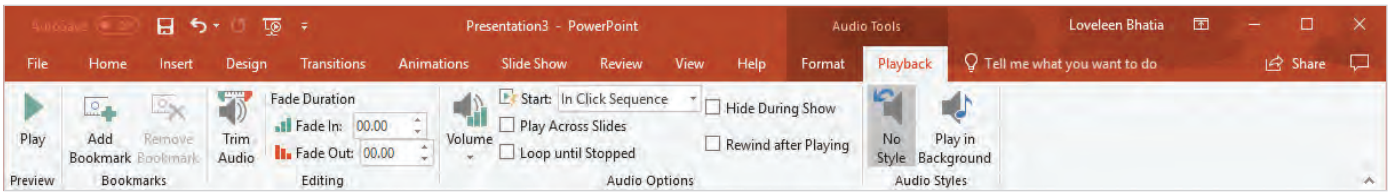


Fig. 3.26 Playback tab

The **Playback** tab has various options in the Audio Options group to control the audio file. These are discussed further.

Volume—to increase or decrease the volume of the file

Start—to start the audio on the click of the mouse or automatically

Play Across Slides—to play the same audio across all the slides in a presentation

Loop until Stopped—to play the sound again and again until it is stopped

Hide During Show—to hide the sound icon during the slide show

Rewind after Playing—to start the audio file from the beginning when it completes playing

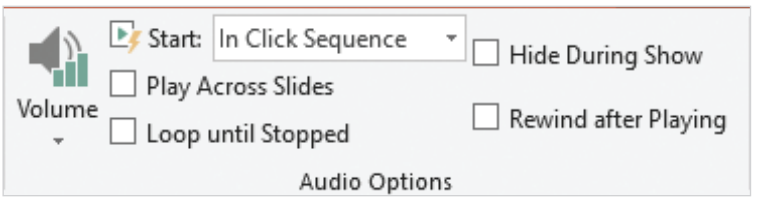


Fig. 3.27 Audio Options group

Adding a Video Clip to a Presentation

Sneha has one more task now—adding a video clip to the story of magnets. Her brother tells her that it is added to a presentation in the same way an audio clip is added. The only difference is of the **Online Video...**

option, which is used to insert a video file from the internet. Her brother searches for an animated video showing the story of magnets for her.

Sneha is quite happy now. Her presentation is full of animation, audio, and video.

Transitions

Sneha is now able to do the following:

- Apply an animation effect to an object
- Apply multiple animation effects to an object
- Copy an animation effect
- Change the timing and order of an animation
- Add audio and video clips to her presentation

She thanks her uncle for teaching her all about the animations in PowerPoint. She has made quite a few animations in PowerPoint since then. Her computer teacher also helps her create different types of animations in PowerPoint.

Remember

- Animations are applied on the slide elements.
- Transitions are applied on the entire slide.

Today in her computer class, she has learnt about one more thing in PowerPoint—transitions. Her teacher has told the class that a transition is the way in which one slide comes after another in a slide show.

Adding a Transition Effect

Sneha wants to add a transition effect to her presentation 'Magnet attracts Iron', which is saved on her computer. She opens the presentation and follows these steps.

1. After selecting the slide in the **Slide Navigation** pane, she clicks on the **Transitions** tab.
2. She then goes to the **Transition to This Slide** group and clicks on the **More** drop-down button to see the available effects.

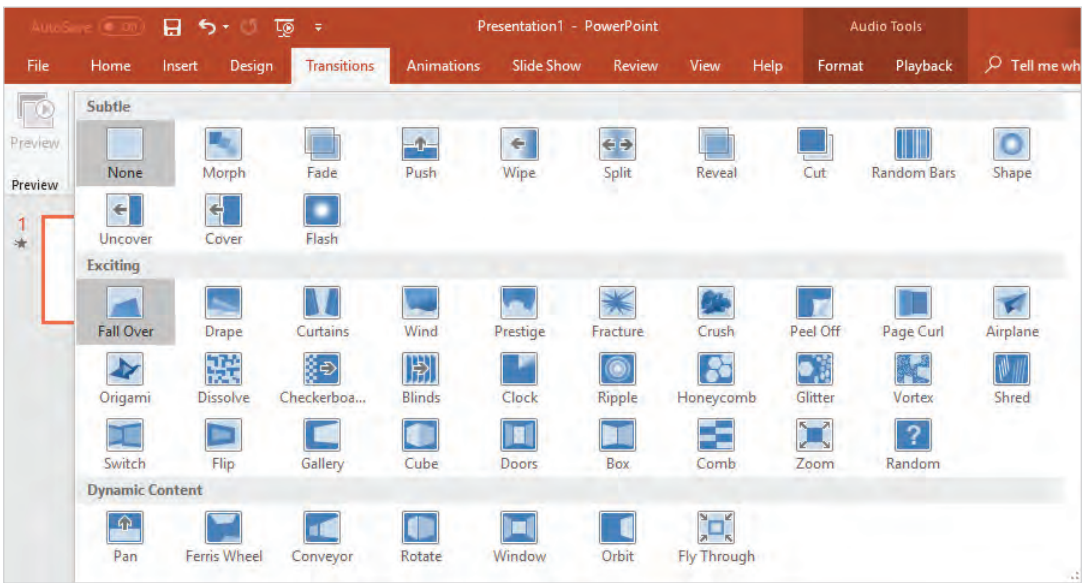


Fig. 3.28 Transition effects

3. She chooses the **Fall Over** effect and clicks on it.

Sneha has also learnt from her computer teacher that a transition sound can also be added to PowerPoint. She clicks on the down-arrow next to the **Sound:** command in the **Timing** group. From the menu, she hovers over the sound to listen to it. She clicks on **Chime**.

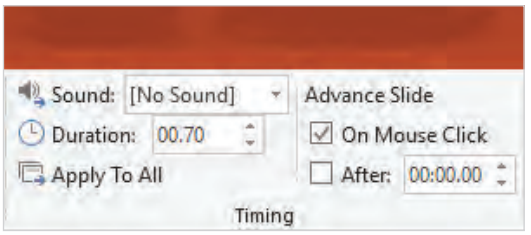


Fig. 3.29 Timing group

Now she goes to the **Duration:** box to set the desired timings for the sound.

She clicks on the **Apply to All** command as she wants to apply the transition to all the slides in her presentation.

Under the **Advanced Slide**, she checks the **On Mouse Click** as she wants the slide to stay on screen until a mouse button is clicked. The **After:** command can be checked to set the time in case she wants the next slide to appear after a set time automatically.

Checkpoint

Choose the correct options.

1. Which of the following statements is true?
   a) Animation effects are applied between slides.
   b) Transition effects are applied between slides.
   c) It is not possible to animate text in PowerPoint.
   d) Animations are videos inserted in PowerPoint.
2. Which of the following tabs lets you control a video you have inserted in a PowerPoint presentation?
   a) Insert b) Slide Show c) Playback d) Format
3. Which of the following contextual tabs appears when you insert an audio file in a PowerPoint presentation?
   a) Audio tools b) Video tools c) Review d) Data
4. Which of the following is an animation effect in PowerPoint?
   a) Exit b) Move c) Slide d) Create
5. Which of the following is not valid for the Video Options group?
   a) Volume b) Play Full Screen c) Hide While Not Playing d) Trim Video

Rehearse Timings Features

Sneha and Tandeep are in their computer lab. Sneha is enjoying creating PowerPoint presentations and adding animation effect, action button, audio, video, and transition effect to them. She has now understood that it's fun to create PowerPoint slides on various topics and it will help her remember facts.

Today she is learning about the Rehearse Timings feature of PowerPoint. Her teacher tells the class that while preparing a PowerPoint presentation, they may want to set up it in such a way that they

don't need to click through the slides while presenting it. She then introduces the class to the **Rehearse Timings** features.

She tells the class that this feature gives them an idea of how long the current slide needs to be displayed before moving on to the next slide.

'This information is used to set up the show. You can set the timing for each slide and then use the **Set Up Show** option,' she tells the class.

Rehearse Timings

The teacher opens a presentation. She shows the class how to rehearse timings on a presentation in a stepwise manner:

1. She searches for the **Rehearse Timings** command under the **Slide Show** tab and clicks on it.
2. The PowerPoint window changes to a full-screen window. The **Recording toolbar** appears in the upper left corner of the window.

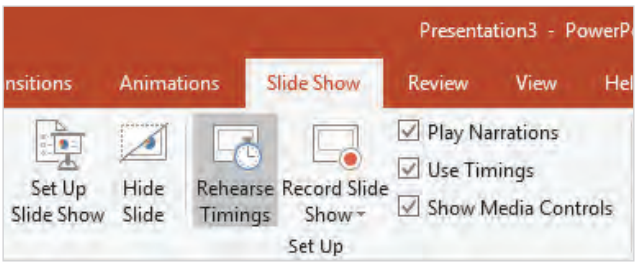


Fig. 3.30 Rehearse Timings command

The teacher now explains the Recording toolbar to the class. Her presentation has three slides. She sets the timing for each slide as follows:

- She clicks on the **Pause Recording** button to set the timing for the first slide. She clicks on **Next** after 0:00:10 to move onto the next slide. The timing for the first slide has been set to 10 seconds.

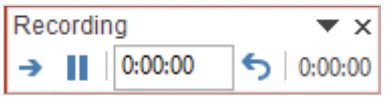
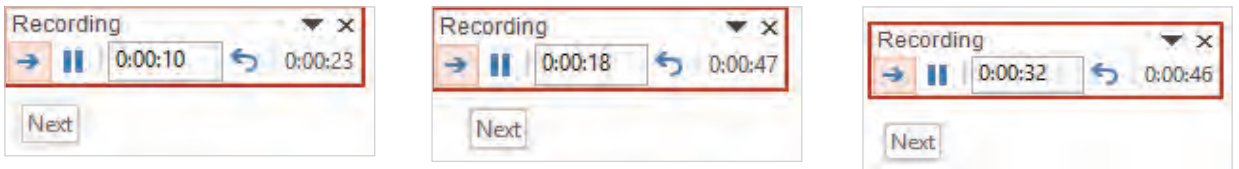


Fig. 3.31 Recording toolbar

- She now clicks on **Next** after 0:00:18. The timing for the second slide has been set to 8 seconds.
- After 0:00:32, she clicks on **Next** again. The timing for the third slide has been set to 14 seconds.
- She clicks on **Repeat** to make the timer start again for the current slide.



a) b) c)

Fig. 3.32 Setting timings for slides

After setting the time for the last slide, she gets a prompt asking whether she wants to keep the recorded timings or discard them.

Record Narration

The teacher now explains the **Record Narration** feature to record a description in her own voice to play during the slide show. She shows to the class how to do it:

1. She searches for the **Record Slide Show** command and clicks on its drop-down arrow. Then she selects the **Record from Beginning…** option.
2. The presentation changes to a full-screen window. The teacher clicks on the **Record** button and starts recording her voice. She speaks about nature and plants around us. She clicks on the **Advance to the next slide** button to move to the next slide.

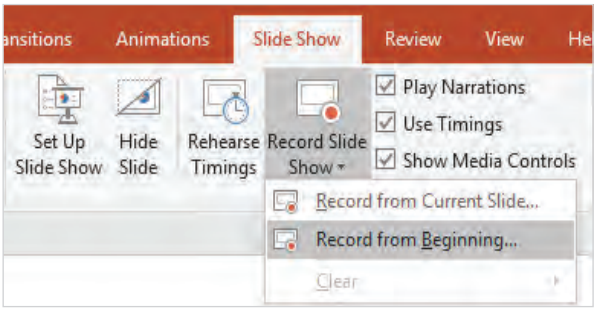


Fig. 3.33 Record Slide Show option

Fig. 3.34 Recording toolbar on a full-screen window

Key Terms

Action button	A button that can be used to perform some special mouse activity
Animation	An effect that you can apply on an object on a PowerPoint slide
Transition	An effect that appears when you move from one slide to another

Recap

- PowerPoint is a tool that is used for making presentations.
- Charts are a way of representing data graphically. There are a variety of charts available in PowerPoint, such as column, bar, area, and line charts.
- You can embed any other file, such as a Word document or an Excel spreadsheet, in your presentation.
- Animations are the effects that can be applied to the objects in a PowerPoint presentation, such as text, graphics, images, and charts.
- Action buttons are the built-in shapes that can be used to link to another slide or perform any other action, such as play or stop a sound clip.
- PowerPoint gives you the ability to add audio and video clips to your presentation. It is also possible to record your voice and then add it to a slide.
- Transitions are the effects that are applied to all the slides of a PowerPoint presentation.
- Rehearsal is a feature that helps you make sure that your presentation is within the decided timeframe.

Exercise

A. Choose the correct options.

1. Which of the following tabs will you click to add a recorded sound?

   a) Home b) Animations c) Transitions d) Insert

2. Which of the following features helps you make self-running presentations?

   a) Action button b) Rehearsal c) Marker d) Master slide

3. Which of the following Toolbar options will you click on to adjust the Transitions timing?

   a) Advance Slide After option b) Duration
   c) Change the Transition d) None of these

4. Which group has the Audio and Video commands under the Insert tab?

   a) Media b) Audio c) Video d) Text

5. In which group under the Insert tab will you find the option to import a Word document?

   a) Media b) Import c) Object d) Text

B. State *true* or *false*.

1. An audio clip cannot be added to a PowerPoint presentation.
2. The Rehearsal feature is used to practise a PowerPoint presentation.
3. The Audio button is present in the Media group under the Insert tab.
4. To add an action button, you click on the Shapes command.
5. It is not possible to insert an Excel spreadsheet in the slide.
6. You can change the chart type after you have inserted a chart.

C. Fill in the blanks.

1. The _____ tab is used to insert charts.
2. The effects that you apply to move objects are called _____ effects.
3. Using the _____ feature, you can time your presentation.
4. The _____ command is used to embed an Excel file in a slide.
5. To remove an animation effect, select the _____ effect.

D. Answer the following questions.

1. Briefly explain the steps to format a chart in PowerPoint?
2. How can you add an audio clip to your presentation?
3. What is the difference between animations and transitions in PowerPoint?
4. What is the Rehearsal feature and how is it useful?
5. Explain the steps to add the Action buttons.
6. How can you set timings for a slideshow in PowerPoint?
7. Write the steps to add transition effects to a PowerPoint presentation.

Application-based Questions

1. Neha has added a video clip to her presentation, and she wants to do the following tasks:
   i) Play the video continuously till she stops it on her own
   ii) Start the video automatically
   Help her in doing the tasks, and write the options she should use in each case.
2. Sumeet wants to create a presentation on his hobbies. He has added an audio file of his favourite song. He wants to link this slide to another slide where he has described the song. How does he do this?
3. Abe wants to show how his cricket average has improved over time. What is the best way to do this?

Lab Activity

1. Create a presentation on global climate change. Collect data and add charts to show climate change in India over the past few years.
2. Create a presentation on the digestive system. Add animation and transition effects wherever possible. You can also add your recorded voice to the slide to explain the function of each part.
3. Create a presentation on a topic from your favourite subject. The presentation must have four parts—a video explaining the topic, a voice recording, an animation, and a textual explanation. Also the starting slide should have a menu that can help you explain the topics when presenting.

Project

1. Create a presentation on the topic ‘Endangered species of India: Trend and Analysis’. The presentation should contain at least ten slides. Add charts, audio and video clips, and action buttons to your presentation. Add animation and transition effects to make your presentation look attractive.
2. There is a workshop in your school to promote co-curricular activities. Your class teacher wants you to create a presentation on the activities that have taken place in your school. The presentation will be displayed in the workshop. It will contain a video. The presentation must run on its own continuously without you having to intervene at any point. There must be a voice-over. Create the presentation and write the steps you followed.

Explore More

- Do research on the actions that can be performed by the action buttons.
- Find out how Animation pane is useful?

Weblinks

- http://www.dummies.com/software/microsoft-office/PowerPoint/

Work Wisely

- It is not a good practice to add too many animation and transition effects. It increases the overall presentation time and as a result the audience gets bored. It also may distract from the point you are trying to make.
- Do not add a very long video or audio to a presentation unless the presentation is meant to run on its own. It's the presenter who must be heard and to whom the audience must pay attention. The PowerPoint presentation is merely an aid to help you put your points across.

Notes for the Teacher

- Discuss and explain the importance of each chart type.
- Emphasize the need for choosing the right type of chart for making an effective presentation.
- Demonstrate how to add, delete, copy, and move animation and transition effects. Explain how these effects are useful and can enhance a presentation.
- Encourage students to complement their presentation with suitable animation effects and audio and video files.
- Discuss the significance of the Rehearsal feature.
- Make them understand the use of action buttons.

4 Editing and Formatting Text in Excel

After going through this chapter, you will be able to—

- **select** cells, rows, and columns;
- **insert**, **copy**, **move**, and **delete** cells;
- **format** fonts in Excel;
- **wrap**, **merge**, and **align** text; and
- **use** the Auto Fill and Flash Fill options.

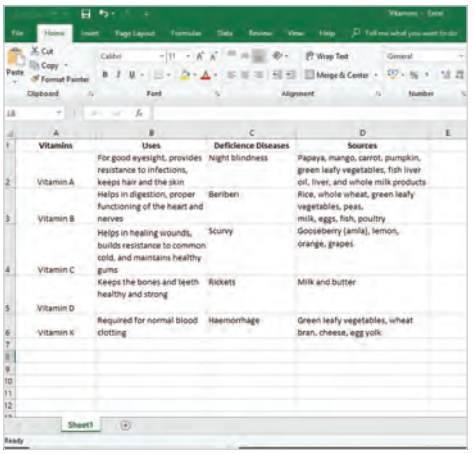
Junaid is reading a chapter on Components of Food. He is reading carefully the types of nutrients—carbohydrates, fats, vitamins, minerals, water, and roughage. He wants to create a sheet in Excel and lists some important vitamins, their functions, diseases that can occur due to their deficiency, and their sources. It will help him learn all the information about these vitamins easily. He named the workbook 'Vitamins'. Junaid now opens a blank workbook. He could have also chosen a template. Junaid knows that a cell is the basic component of a worksheet, where data is entered. He starts clicking on cells and typing in the data. In class 5, he has learnt about entering data in Excel.

Editing a Worksheet

Just when he was working on his worksheet, his uncle, Aslam, comes in. He helps Junaid enter data. He tells him that after typing in, he should click on the option **Wrap Text** under the **Alignment** group in the **Home** tab.

Junaid creates the worksheet with the help of his uncle as shown in Fig. 4.1.

Now his uncle asks him to add sunlight also as a source of vitamin D besides milk and butter. He tells Junaid that our body when exposed to sunlight produces vitamin D.



Vitamins	Uses	Deficience Diseases	Sources
Vitamin A	For good eyesight, provides resistance to infections, keeps hair and the skin	Night blindness	Papaya, mango, carrot, pumpkin, green leafy vegetables, fish liver oil, liver, and whole milk products
Vitamin B	Helps in digestion, proper functioning of the heart and nerves	Beriberi	Rice, whole wheat, green leafy vegetables, peas, milk, eggs, fish, poultry
Vitamin C	Helps in healing wounds, builds resistance to common cold, and maintains healthy gums	Scurvy	Gooseberry (amla), lemon, orange, grapes
Vitamin D	Keeps the bones and teeth healthy and strong	Rickets	Milk and butter
Vitamin K	Required for normal blood clotting	Haemorrhage	Green leafy vegetables, wheat bran, cheese, egg yolk

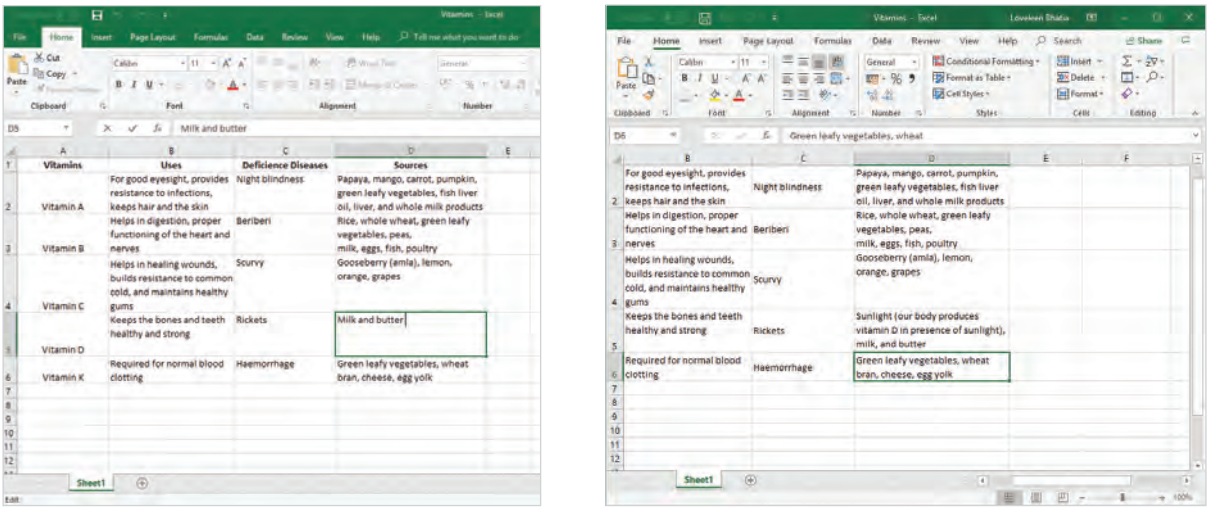
Fig. 4.1 A worksheet

Now Junaid needs to edit the content in the cell D5. He follows these steps as told by his uncle:

- He double-clicks on the cell D5. The mouse pointer starts blinking in the cell. Junaid notices that the **Status** bar displays the **Edit** mode.
- He adds the new content and presses the **Enter** key.
- The **Edit** mode gets closed and the next cell gets selected in the downward direction. Junaid checks the status bar. It shows **Ready** mode.

Quick Tip

When you type data in a cell, the Cancel and Enter buttons become active on the Formula bar. The Enter button is used to record the cell entry, and the Cancel button is used to discard the cell entry. If there was some data already in the cell, it will remain unchanged.



a) Selecting a cell b) Data modified

Fig. 4.2 Modifying data in a cell

Junaid's uncle tells him that he can also modify the data by simply selecting the cell D5 and typing the new data in the cell. This will replace the data in the cell with the new data.

Undo and Redo Commands

Junaid's uncle now tells him about Undo and Redo commands. He tells him that while entering data in a cell, if he by mistake types wrong spelling of a word or wrong information, he should click on the **Undo** command. If he wants to repeat the last action performed, he should click on the **Redo** command. Junaid's uncle shows him the Undo and Redo commands on the **Quick Access Toolbar**.

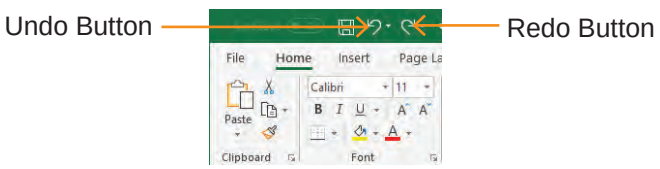


Fig. 4.3 Undo and Redo commands

Quick Tip

You can use Ctrl + Z to undo an action and Ctrl + Y to redo an action.

Deleting Cell Contents

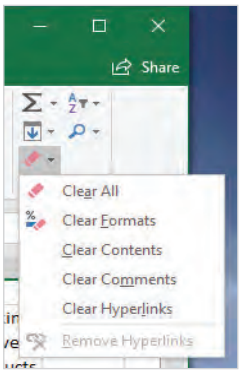


Fig. 4.4 Clear Contents option

'Can we delete the contents of a cell in Excel,' Junaid asks his uncle.

'Yes, of course. Let me show to you the two ways for deleting the contents of a cell,' his uncle replies.

He tells him the ways for deleting cell contents:

- Select the cell(s) and press the **Delete** key.

  or

- Select the cell(s), right-click, and select **Clear Contents** from the menu.

Copying and Moving Data

Junaid now wants to list all the vitamins separately.

His uncle tells him that for that he can just copy and paste the data of the column A1.

Quick Learn

Junaid's uncle while showing the ways to delete cell contents, forgot to tell him about one more way to delete the cell content. Can you figure it out?

Copying Data

Junaid follows these steps to duplicate the data of the column A:

1. He selects all the cells of the column A.
2. He then searches for the **Copy** command and clicks on it.
3. He now goes to the column F and clicks on the **Paste** command.

Junaid's uncle tells him that the **Paste** command shows different paste options. Moving the mouse pointer over each option shows the preview of the pasted data. Clicking on the required option copies the data to the selected cells. He also tells him that he can click the **Paste** command many times to paste the same data repeatedly.

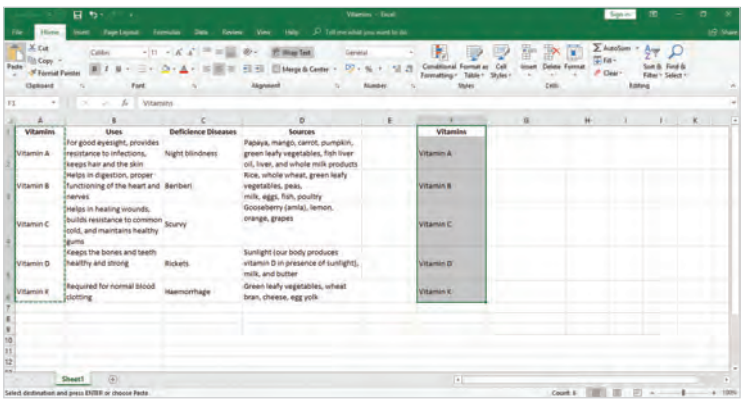


Fig. 4.5 Copying and pasting data

Quick Tip

The keyboard shortcut to copy data is Ctrl + C, and the shortcut to paste data is Ctrl + V.

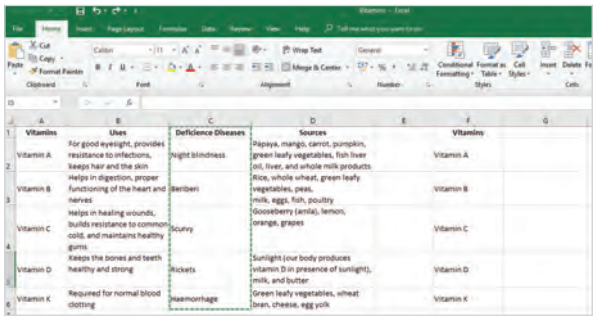
Now Junaid wants to move the data in the column C to the column G to complete his list of vitamins and the related deficiency diseases. He follows these simple steps as told by his uncle:

1. He selects all the cells of the column C.

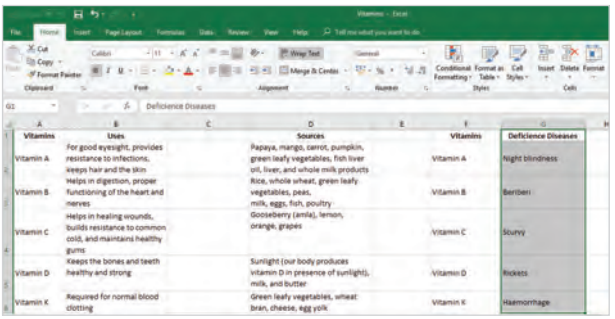
2. He searches for the **Cut** command and clicks on it.
3. After going to the column G, he clicks on the **Paste** command. The content is moved from the column C to the column G.

Quick Tip

You can use the Ctrl + X keyboard shortcut to cut the content.



a) Selecting the data to be moved



b) Data moved

Fig. 4.6 Copying and moving data

Checkpoint

Choose the correct options.

1. Which of the following commands is used to reverse a change made recently in a worksheet?
   a) Redo b) Undo c) Cut d) Paste
2. What is the keyboard shortcut for the Redo command?
   a) Shift + Y b) Shift +R c) Ctrl + Y d) None of these
3. What is the shortcut for the Paste command?
   a) Shift + P b) Alt +V c) Ctrl + V d) None of these

Inserting Rows and Columns

Junaid wants to add the information about vitamin D after vitamin C. His uncle tells him that he can add new rows and columns to a worksheet at any time. Junaid is eager to know how to accomplish this task.

His uncle tells him that for inserting a new row, the row above which we want to insert a new row is selected. For inserting a new column, the column to the left of which we want to insert a new column is selected. Junaid now follows these steps:

Remember

- A new row is always inserted above the selected row.
- A new column is always inserted to the left of the selected column.

1. He selects the row 6 as he wants to insert a new row above it and clicks on the **Home** tab.
2. He searches for the **Insert Sheet Rows** option and clicks on it. A new row is inserted.
3. Now Junaid checks if he is able to insert a new column. He clicks on the column C and then on the **Insert Sheet Columns** option. A new column is inserted to the left of the column C.

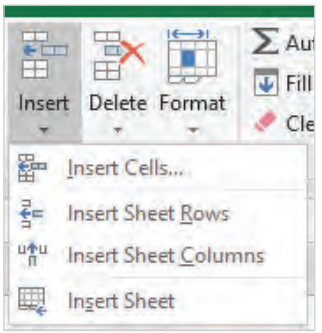


Fig. 4.7 Insert menu

Junaid's uncle tells him that there are two more methods to insert a row or column.

Method 1:

Select a cell and right-click on it. The **Insert** dialogue box appears on clicking the **Insert** option. Clicking on the option **Entire row** will insert a new row above the cell selected. Clicking on the option **Entire column** will add a new column to the left of the cell selected.

Method 2:

- Select a row and right-click on it. Clicking on the **Insert** option will add a row above the selected row.
- Select a column and right-click on it. Clicking on the **Insert** option will add a column to the left of the selected column.

Deleting Cells, Rows, and Columns

Junaid's uncle now explains to him that he can also delete cells, rows, and columns. He shows Junaid the **Delete** command in the **Cells** group. He tells Junaid that first he needs to select a cell, row, or column that he wants to delete and then click on the down-arrow next to the Delete command.

Junaid does so and he finds four options thereon. His uncle explains these to him.

- Click on the **Delete Cells** option to delete the selected cells.
- Click on the **Delete Sheet Rows** to delete the selected rows.
- Click on **Delete Sheet Columns** to delete the selected columns.
- Click on **Delete Sheet** to delete the entire sheet in case it is one of the sheets of a workbook.

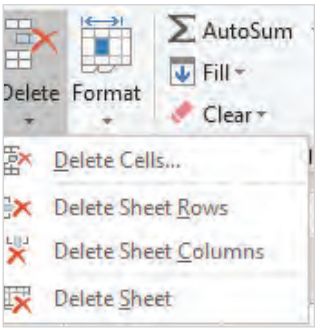


Fig. 4.8 Deleting cells, rows, and columns

Quick Tip

You can also right-click on the selected cells, rows, or columns and click on the Delete option.

Formatting in Excel

Junaid has learnt about creating a worksheet, inserting a new row or column, modifying content in a cell, and deleting the content of a cell, row, or column.

Now his uncle tells him about formatting fonts in Excel. He shows the formatting commands to him.

Remember

A set of letters in a particular size and style is called a font.

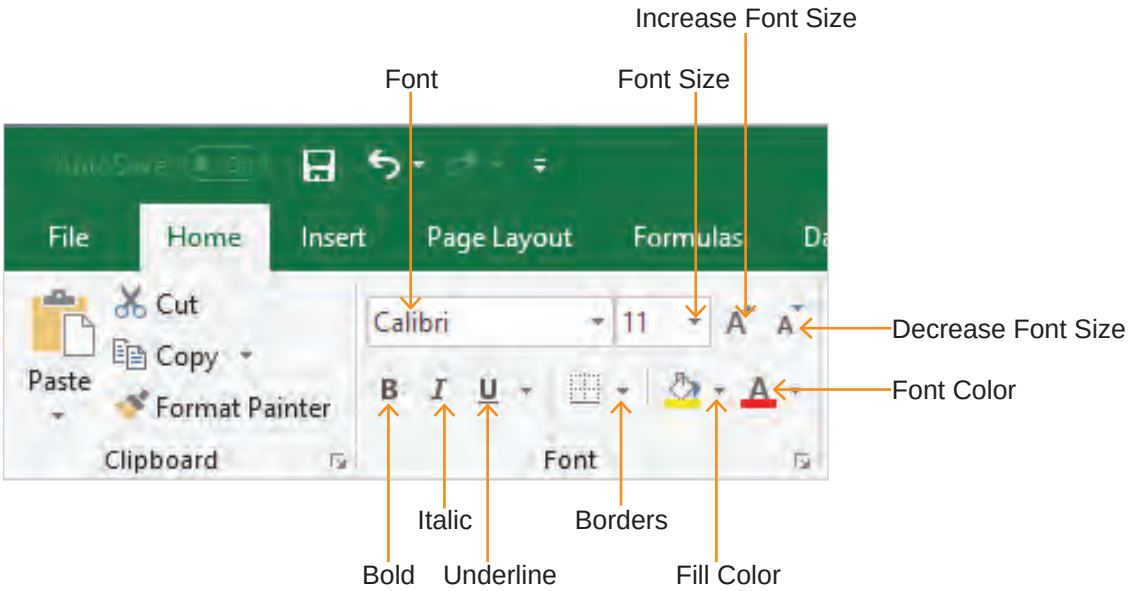


Fig. 4.9 Font group on the Home tab

Junaid finds that the formatting commands, available in the **Font** group on the **Home** tab, are the same as in MS Word.

This time Junaid creates a worksheet listing monovalent, bivalent, and trivalent elements. He wants to try formatting on this worksheet.

Junaid tells his uncle, 'Now I will have to follow the steps for formatting a text here as in MS Word.'

His uncle replies in the affirmative.

Changing Font, Font Size, and Font Colour

For changing the font, font size, and font colour of the data in his worksheet, Junaid simply selects the cells A1:C1 and changes the font type to Arial, font size to 14, and font colour to green.

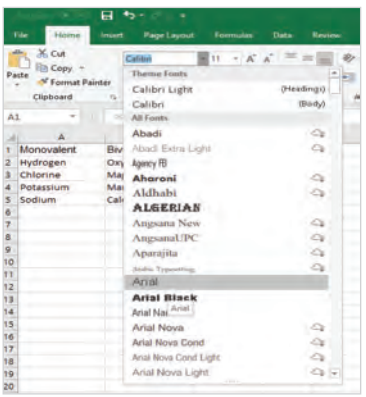


Fig. 4.10 Changing font type

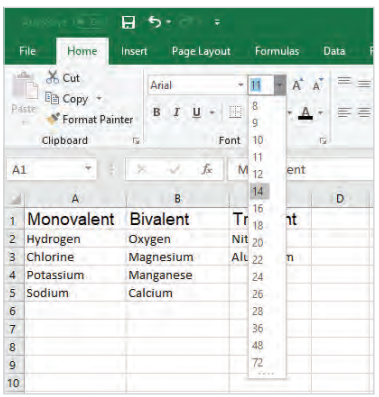


Fig. 4.11 Changing font size

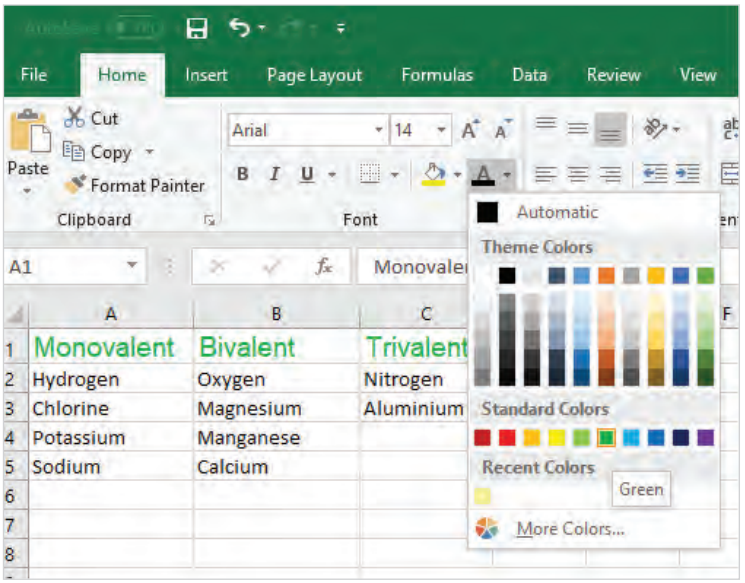


Fig. 4.12 Changing font colour

Quick Tip

You can get more variety of colours by clicking the **More Colors** option. It also allows you to make customized colours.

Applying Bold, Italic, and Underline

To set the text in the selected cells in bold and italics and underline it, Junaid uses the **Bold**, **Italic**, and **Underline** commands in the **Home** tab respectively.

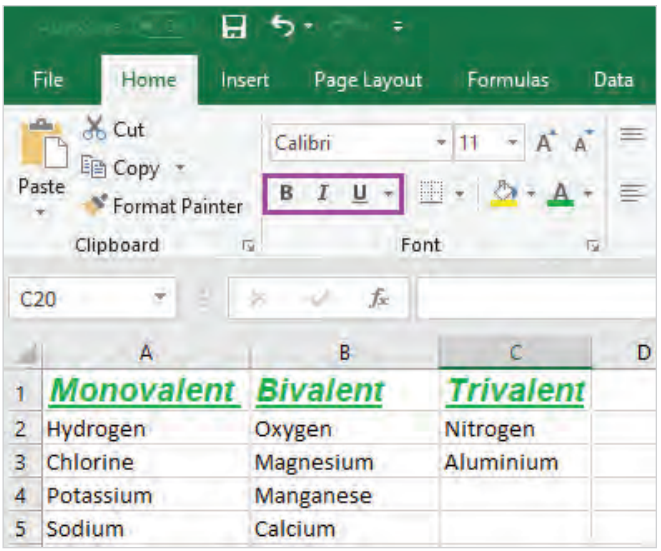


Fig. 4.13 Applying bold, italic, and underline effects

Remember

The Underline button has two drop-down options—Underline and Double Underline.

Adding Background Colour and Border

For adding a background colour to the selected cell(s), Junaid follows these steps:

1. He searches for the **Fill Color** command and chooses the desired colour from the drop-down menu. This colour will appear in the selected cells. His uncle tells him that for more colour options, he can select the **More Colors …** option.

2. For adding borders, he selects the entire data in the worksheet. He then goes to the **Borders** command and chooses the **All Borders** option. A border around the data is added.

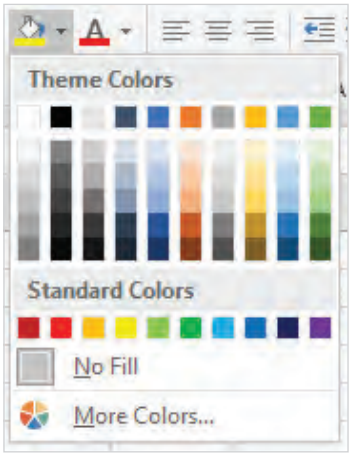


Fig. 4.14 Fill Color option

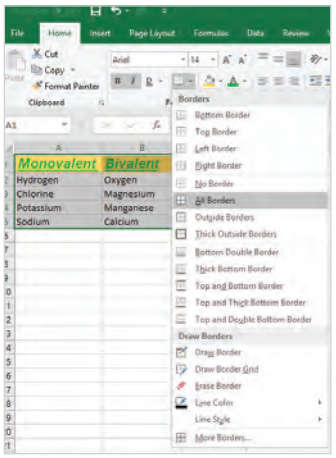


Fig. 4.15 All Borders option

Quick Tip

Here is an alternative method for formatting fonts:
Select the cells and right-click. Then go to the Format Cells option. The Font panel in the Format Cells dialogue box has various options, such as font, font size, underline, and color. You can also add background colour and borders by using the options given in the Border panel.

Alignment and Orientation of Text

'Now let me tell you about alignment and orientation of text in Excel,' Junaid's uncle tells him and shows him the **Alignment** group on the **Home** tab.

Junaid asks his uncle, 'What is alignment?'

His uncle replies, 'It is the placement of text in a cell of a worksheet.'

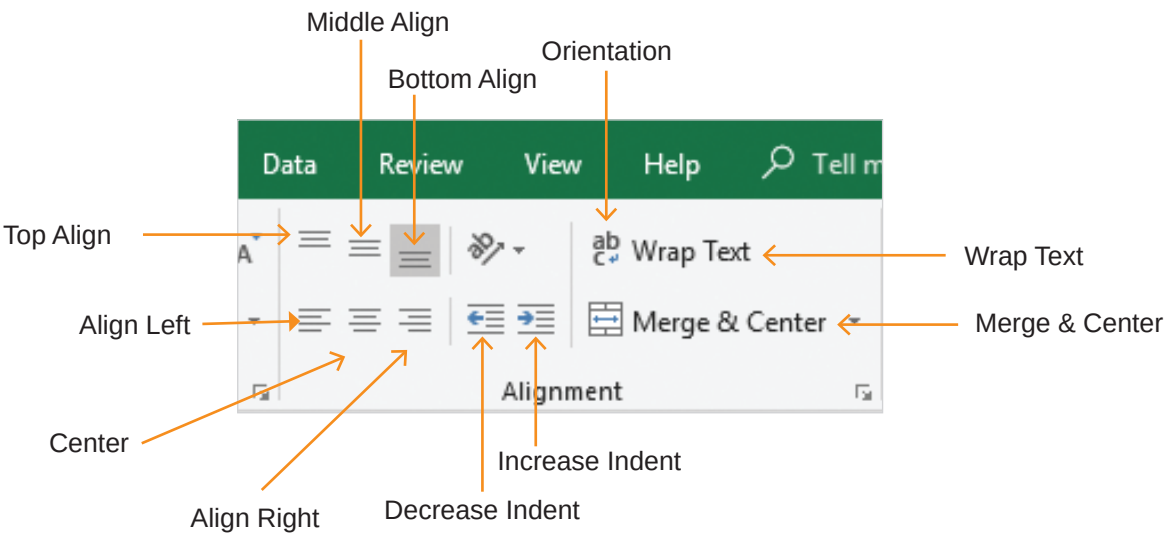
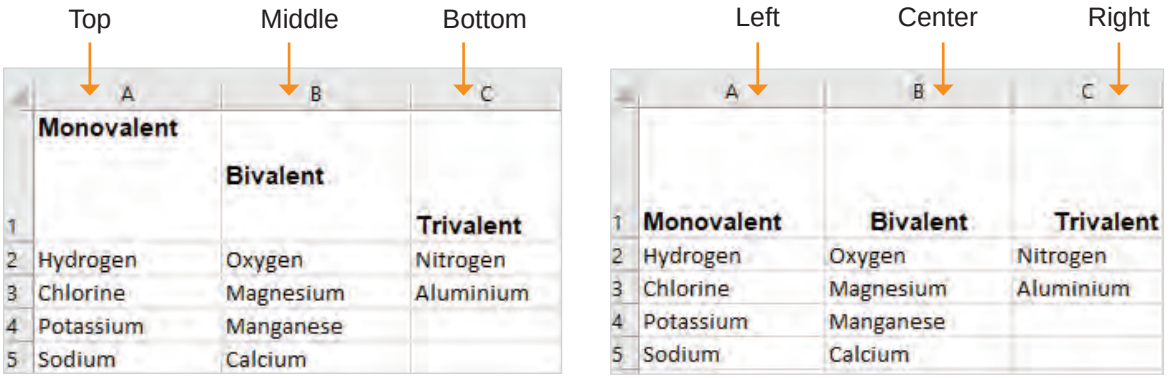


Fig. 4.16 Alignment group on the Home tab

Junaid's uncle now starts explaining to him the uses of the various commands.



	A	B	C
1	**Monovalent**	**Bivalent**	**Trivalent**
2	Hydrogen	Oxygen	Nitrogen
3	Chlorine	Magnesium	Aluminium
4	Potassium	Manganese	
5	Sodium	Calcium	

a) Horizontal alignments

	A	B	C
1	**Monovalent**	**Bivalent**	**Trivalent**
2	Hydrogen	Oxygen	Nitrogen
3	Chlorine	Magnesium	Aluminium
4	Potassium	Manganese	
5	Sodium	Calcium	

b) Vertical alignments

Fig. 4.17 Horizontal and vertical alignments

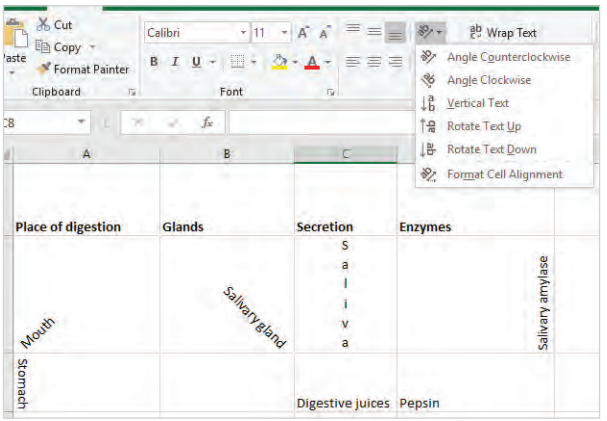


Fig. 4.18 Wrap Text options

Changing Row Height and Column Width

Junaid wants to change the height and width of columns.

'By default, the row height is 12.75 points and the column width is 8.43 characters,' he was told by his uncle.

'But you can adjust the height and width any time you want,' he further tells Junaid.

Junaid's uncle tells him that he can click on the **Format** down arrow button on the **Home** tab. On doing so, Junaid clicks on the **Row Height** option.

His uncle then shows to him the **Row Height** and **Column Width** boxes. He asks Junaid to click inside the box and type the values thereon.

Quick Learn

Consider the worksheet given below, and answer the questions that follow.

	A	B
1	**Class 6**	
2	**Teacher's Name**	**Subject**
3	Sunita	Hindi
4	Akshma	Maths
5	Sanjay	Science
6	Preeti	SST
7	Jaya	English

a) Set the row height to 20 and column width to 10.

b) What will happen if you set the row height and column width to 0?

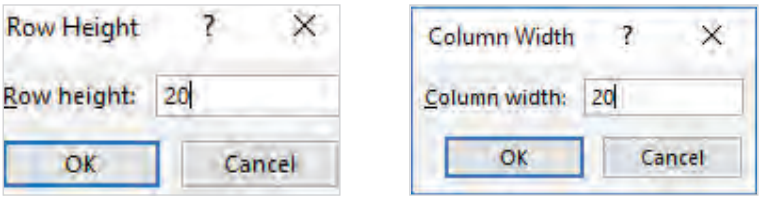


Fig. 4.19 Changing the row height or column width

Auto Fill and Flash Fill

Junaid has learnt about formatting text in Excel and changing row height and column width.

'At times, you may want to enter the same data in Excel repeatedly. Excel has two very important features—Auto Fill and Flash Fill,' Junaid's uncle tells him.

Let us learn about them one by one.

Auto Fill

The Auto Fill feature lets you fill the cells with a series of data without typing the values. It can be used to fill a series of numbers, days, months, weekdays, and years.

'Suppose you want to make a plan on how you will cover all the topics of different subjects this year. You need to first list the months of the year,' Junaid's uncle tells him.

Junaid opens a new worksheet and writes January on a cell. To use the **Auto Fill** tool, his uncle guides him through these steps:

1. He selects the cell where January is written.
2. There he sees a tiny green square in the bottom-right corner of the selected cell. He is asked by his uncle to move the mouse pointer over it. The green square changes to a plus sign. His uncle tells him that this plus sign is known as the Fill Handle.
3. Junaid drags the plus sign down to the adjacent cells. He notices the cells getting filled with the months of the year automatically. He finds out that he can do this with numbers and letters too, and even with the days of the week.

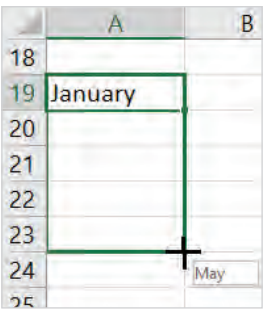


Fig. 4.20 Fill Handle

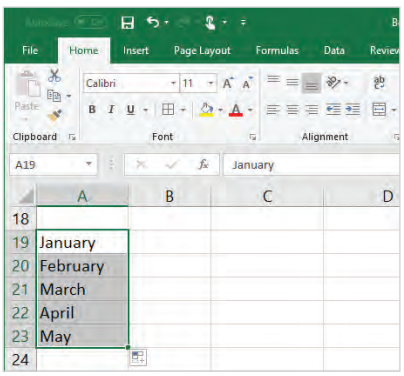


Fig. 4.21 Cells getting filled

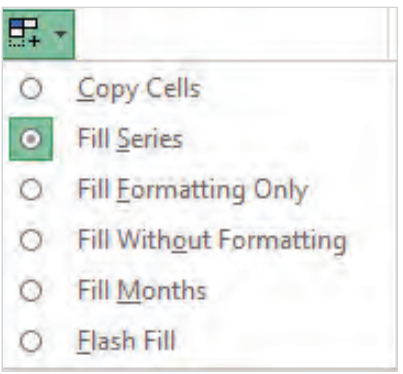


Fig. 4.22 Auto Fill options

Junaid's uncle tells him that when we drag the Fill Handle, the Auto Fill Options button is also displayed. When clicked, the button shows a list of actions. He explains the actions and their functions to Junaid.

Auto Fill Option	Action
Copy cells	To copy the content of a selected cell to fill the range of cells you want
Fill Series	To fill the range of cells with the next set of values in the series
Fill Formatting Only	To apply the formatting of a selected cell to the range of cells specified by the fill operation
Fill Without Formatting	To fill the range of cells with the next set of values in the series, and it ignores any formatting applied to the selected cell
Fill Months	Changes according to the series you specify
Flash Fill	Identifies the pattern and fills the cells automatically

Creating Custom Lists

Junaid's uncle tells him that he can also create his own custom list in Excel. For that, he needs to follow the steps given below.

1. Open a worksheet, type some data, say the names of the outdoor games you like.
2. Select the list and click the **File** tab. Click **Options**. The **Excel Options** dialogue box opens up.
3. In the left pane, click **Advanced** and under the **General** section, click the **Edit Custom Lists…** button.

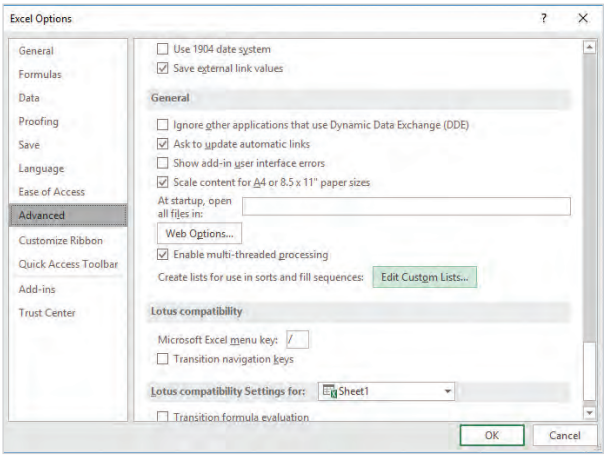


Fig. 4.23 Excel Options dialogue box

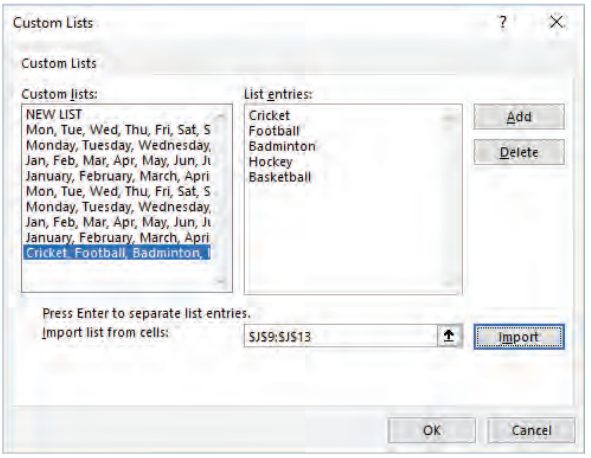


Fig. 4.24 Custom Lists dialogue box

4. The **Custom Lists** dialogue box opens up. Click **Import** to fill the list of items you selected. The selected cell range will be displayed in the **Import list from cells**: text box. The list gets added to the **List entries**: box.
5. Click on **OK** on both the dialogue boxes.
6. In the worksheet, type the first entry of the list and drag the Fill Handle. The list gets filled.

Flash Fill

Now Junaid's uncle tells him about the Flash Fill feature. He tells him that this feature identifies the specific pattern used to fill data and fills the rest of the data accordingly.

'How?' Junaid asks his uncle.

'Let us write the names of your classmates,' he tells Junaid.

After opening a new worksheet, Junaid follows these steps.

Fig. 4.25 Flash Fill feature

1. He creates two columns. In the first column, he enters the first name of his friends, and in the next column, he enters the last name of his friends.
2. In the next adjacent cell, he completes one cell of the column himself. He writes the full name for the first row.
3. He now selects that cell and click in the **Flash Fill** button under the **Data** tab.

Junaid observes that all the subsequent rows have been filled in the same pattern.

Key Terms

Spreadsheet	A Microsoft Excel document
Workbook	A file created by Excel
Worksheet	A combination of rows and columns. Part of a workbook
Undo	To reverse the change recently made
Redo	To repeat the effect of the Undo command

Recap

- To add data to a cell, double-click on the cell and start typing in the data.
- The undo command is used to reverse the last action performed.
- The redo command is used to repeat the last action performed.
- The cell content can be deleted using the Delete key.
- The Copy and Paste commands are used to duplicate data.
- The Cut and Paste commands are used to move the data from one location to another.
- A new row can be added to the above of the selected row.
- A new column can be added to the left of the selected column.
- A worksheet can be formatted using the various formatting features of the Font group.
- The Auto Fill feature lets you fill the cells with a series of data automatically.
- The Flash Fill feature lets you automatically fill data based on a specific pattern.

Exercise

A. Choose the correct options.

1. Which of the following tools is used to fill data based on a specific pattern?
   a) Auto Fill b) Flash Fill c) Series Fill d) Pattern Fill
2. What is the default file extension of an Excel workbook?
   a) .xlsx b) .xslx c) .excel d) .exl
3. Which of the following tabs will you click to adjust the row height in an Excel sheet?
   a) File b) Home c) View d) Format
4. How can you duplicate data in Excel?
   a) Using Ctrl + Shift + N keys b) Using the Redo command
   c) By copying and pasting the data d) Using the Undo command
5. What is the shortcut for the Cut command?
   a) Ctrl+X b) Ctrl+C c) Alt+X d) Shift+X

B. State *true* or *false*.

1. The Flash Fill feature lets you fill the cells with a series of data automatically.
2. To delete cell contents, right-click on the cell and select the Clear Contents option.
3. The Undo and Redo commands are present on the Quick Access Toolbar.
4. The Alignment commands are present under the Home tab.
5. To insert a new row, you need to click on the Add Row button.

C. Fill in the blanks.

1. _____ is the keyboard shortcut to redo an action.
2. To replace the content of a cell, type in the new data and press the _____ key.
3. The Insert Sheet Rows and Insert Sheet Columns commands are present in the _____ tab.
4. The _____ Handle is used to fill the cells with a series of data automatically without typing the values.
5. The _____ feature lets you automatically fill data based on a specific pattern.

D. Answer the following questions.

1. Briefly explain the steps to create and save a new workbook.
2. How can you edit content in Excel?
3. Explain the steps to insert cells, rows, and columns in Excel.
4. Describe the Auto Fill feature with an example.
5. How can you change the row height and column width?

Application-based Questions

1. Consider the worksheet given below, and answer the questions that follow.

	A	B	C	D
1	XYZ Store			
2	Product	Number of units	Price	Total
3	Beauty Products	10	50	500
4	Accessories	20	10	200
5	Clothes	10	100	1000
6	Eatables	16	12	192
7	Handbags	15	200	3000
8	Shoes	5	150	750

   a) What is the address of the cell that contains 'Eatables'?
   b) The mouse pointer is placed in cell C8. Which key will you press to edit the content in that cell?
   c) How will you add a new column before column D?
2. Rohan has created an Excel giving details of his household expenditure for the month of January to May. By mistake, he typed the expenditure in column A and names of the month in column B. Write the steps to shift the month column before the expenditure column.
3. Rohan wants to create an Excel to list down the things he collected during his visit to Chennai. He added the names of the things to column A. He wants to add a column before column A and add serial number using the Auto Fill feature. Help him in doing so.

Lab Activity

1. Sanjana's class teacher asked her to create a worksheet showing the details of all the students in her class as shown below.

	A	B	C	D	E	F
1	Students Details				Phone no.	
2	S.No.	Name	Grade	Age	Code	Number
3	1	Aashish	6	11	98	7587
4	2	Akanksha	7	12	91	56342
5	3	Divya	6	11	12	38753
6	4	Mohit	5	11	34	23756
7	5	Neha	6	11	25	2387
8	6	Nupur	7	12	11	3497
9	7	Rahul	6	12	11	2893
10	8	Sonia	7	11	98	20399
11	9	Sunil	6	10	45	3498

   Now make the following changes in the worksheet.
   a) Add a column 'Roll No.' before column B.
   b) Copy the data in row 5 to row 7.
   c) Delete row 5.
   d) Add a new heading in column G, and show the full phone number. Which feature of Excel will you use?
   e) The column 'Code' must show the values as '098', '091', and so on. How will you do that? Write the steps.

2. Neha is planning and organizing a birthday party for her friend. She has created a worksheet to list down the details of all their friends as shown below.

   Help Neha do the following tasks:

   a) Add a row after row 8 and enter the data as 'Manjeet', '6', '13', 'Yellow'.
   b) Change the row height of the rows to 17 points.
   c) Change the column width to 18.
   d) Add a column 'S.No.' before column A, and use the Auto Fill feature to add the serial number.

	A	B	C	D
1	For Birthday Party			
2	**Name**	**Grade**	**Age**	**Favourite Colour**
3	Aashish	6	11	Yellow
4	Aashna	6	12	Green
5	Bharti	6	11	White
6	Divya	6	11	Red
7	Gauransh	6	11	Red
8	Mohit	6	11	White
9	Neha	6	11	Black
10	Nupur	5	11	Orange
11	Rohit	5	11	Purple
12	Sonia	6	11	Black
13	Sunil	5	10	Red

Project

1. Create a spreadsheet in Excel titled 'Session 2018–2019' with seven columns. The columns will represent the following:
   - Roll number
   - Student name
   - Final-term percentage
   - First-term percentage
   - Second-term percentage
   - Final grade
   - Class teacher

   Create this spreadsheet containing names of all the students in your batch.

2. Create an Excel worksheet and name it Temperature. Enter the month-wise temperatures of Delhi, Mumbai, and Chennai. Format the worksheet by using as many features as you can.

Explore More

- Find out how you can format cells in Excel.
- Find out how custom lists can be useful in Excel.

Weblinks

- https://products.office.com/en-in/excel
- https://www.tutorialspoint.com/excel/index.htm

Work Wisely

Format the worksheet properly. Do not use too many formatting features.

Notes for the Teacher

- Help students to try out the different ways to copy and move data.
- Demonstrate all the methods to select cells, rows, and columns.
- Discuss the use of the Flash Fill and Auto Fill features. Describe how these are useful in saving time and effort.

5 Sorting and Filtering in MS Excel

After going through this chapter, you will be able to—

- **sort** data;
- **apply** filters in Excel; and
- **make use of** the conditional formatting feature.

Akriti is fond of reading. When she was reading the poem *Foreign Lands* by Robert Louis Stevenson, she came across some difficult words.

- adorned
- dimpling
- looking-glass
- tramping

Akriti looked for the meanings of these words in the dictionary. She created an Excel worksheet and listed the words with their meanings. She also mentioned which part of speech a word is.

Then next week, Akriti read some passages from *Gulliver's Travels* by Jonathan Swift. She listed the difficult words on the same sheet that she created earlier. Now she has a good number of words listed in the worksheet.

	A	B	C
1	**Words**	**Parts of Speech**	**Meanings**
2	Adorned	Adjective	Decorated
3	Looking-glass	Noun	Mirror
4	Dimpling	Adjective	Bubbling
5	Tramping	Verb	Walking
6	Shipwrecked	Adjective	To be left without a ship because of its loss or destruction at sea
7	Lucrative	Adjective	Rewarding, well-paying
8	Desolate	Adjective	Uninhabited
9	Quiver	Noun	A case used for carrying arrows
10	Ventured	Verb	Took the risk even though it might be dangerous
11	Wrench	Verb	To pull violently
12	Volley	Noun	A burst or shower (here, of arrows)
13	Striving	Verb	Trying very hard to do something

Fig. 5.1 A worksheet

Now as Akriti's list of words grows, she feels the need for arranging the words in alphabetical order. She also wants to see how many adjectives, nouns, or verbs are there.

She goes to her elder sister, Priti, who studies in class 10 and asks her for help. Priti tells her that she can do all this by using sorting and filtering features in Excel.

'But what is sorting and filtering?' wonders Akriti.

This is how Priti explains sorting and filtering:

The word 'sorting' means to arrange things in a group in a particular order. You want to arrange these words in alphabetical order. So, what you actually want is to sort your data. The word 'filtering' means to show only the data that meet certain criteria. For example, you can filter your list of words to show only nouns.

Sorting Data

Akriti has now understood that for arranging her word list in alphabetical order, she has to use the Sort option in Excel.

Priti asks Akriti to first select a cell in the column where data is inserted. As she wants to arrange the words in alphabetical order, she selects the cell A1, which is the first cell of the column she wants to sort.

Priti shows her the **Sort & Filter** group options and asks her to locate and buttons.

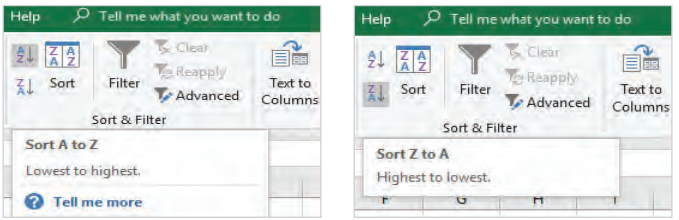


Fig. 5.2 Sort group options

Priti tells Akriti to remember the following:

- Click on to arrange data in ascending order.
- Click on to arrange data in descending order.

Akriti selects and gets the list of words arranged in alphabetical order. Note that the other columns also move as the data in the first column gets sorted.

	A	B	C
1	**Words**	**Parts of Speech**	**Meanings**
2	Adorned	Adjective	Decorated
3	Desolate	Adjective	Uninhabited
4	Dimpling	Adjective	Bubbling
5	Looking-glass	Noun	Mirror
6	Lucrative	Adjective	Rewarding, well-paying
7	Quiver	Noun	A case used for carrying arrows
8	Shipwrecked	Adjective	To be left without a ship because of its
9	Striving	Verb	Trying very hard to do something
10	Tramping	Verb	Walking
11	Ventured	Verb	Took the risk even though it might be
12	Volley	Noun	A burst or shower (here, of arrows)
13	Wrench	Verb	To pull violently

Fig. 5.3 List of words arranged in alphabetical order

Quick Tip

You can also sort data using the Home tab. For that, follow these steps:

- Go to the Editing group and click on the arrow next to the Sort & Filter option.
- Now choose the required option to sort data in ascending or descending order.
- To open the Sort dialogue box, click on Custom Sort from the Sort & Filter drop-down list.

‘We have another task to do now,’ Priti tells Akriti.

‘Do you know that there is an interhouse competition next week in our school,’ says Priti, ‘I am a member of the organizing committee.’

‘Yes, our class teacher has told us. I will also participate in the dance competition,’ Akriti says.

Priti now tells Akriti that she is preparing a list of all the participants of classes I to V mentioning their roll numbers, classes, and houses. She then opens the worksheet.

	A	B	C	D
1	Name	Roll no.	Class	House
2	Palvi	30	III	Jasmine
3	Sunil	32	I	Tulip
4	Anil	1	IV	Rose
5	Neha	23	II	Sunflower
6	Nidhi	22	III	Tulip
7	Roshan	35	V	Rose
8	Ashish	3	II	Sunflower
9	Himanshu	20	III	Tulip

Fig. 5.4 A worksheet

	A	B	C	D
1	Name	Roll no.	Class	House
2	Anil	1	IV	Rose
3	Ashish	3	II	Sunflower
4	Himanshu	20	III	Tulip
5	Nidhi	22	III	Tulip
6	Neha	23	II	Sunflower
7	Palvi	30	III	Jasmine
8	Sunil	32	I	Tulip
9	Roshan	35	V	Rose

Fig. 5.5 Data arranged in ascending order of roll numbers

‘Help me arrange the data in the ascending order of roll numbers,’ Priti asks Akriti.

Akriti selects the cell B1 and clicks on button from the **Sort & Filter** group. The data gets arranged in the ascending order of roll numbers.

Sorting by Specifying Criteria

Now Priti wants to arrange the data according to the class and house. For this, she follows these steps:

1. She selects a cell in the column C and goes to the **Data** tab.
2. She asks Akriti to search for the **Sort** command and click on it. It opens the **Sort** dialogue box.
3. Now Priti selects the following:
   - Class from the **Sort by** drop-down list
   - Cell Values from the **Sort On** drop-down list
   - A to Z from the **Order** drop-down list

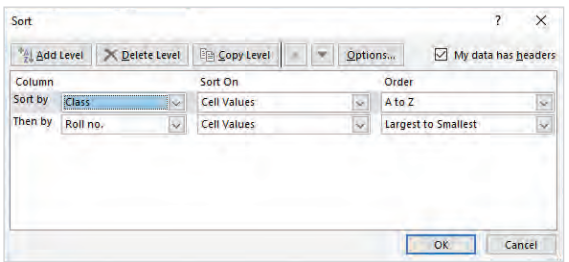


Fig. 5.6 Sort dialogue box

Quick Learn

Make a table like the one shown here in Excel. Sort the data first in ascending order and then in descending order based on column C.

	A	B	C
1	Prefix	Measures (place value)	Multiple/Fraction
2	Kilo	Thousands	1000
3	Centi	Hundredths	0.01
4	Deca	Tens	10
5	Deci	Tenths	0.1
6	Metres/grams/ litres	Ones	1
7	Milli	Thousandths	0.001
8	Hecto	Hundreds	100

4. Now Priti clicks on **Add Level**. Here she chooses Roll no., Cell Values, and Smallest to Largest as **Sort by**, **Sort On**, and **Order** options.
5. She finally clicks on **OK**. The data gets sorted as shown in Fig. 5.7.

	A	B	C	D
1	**Name**	**Roll no.**	**Class**	**House**
2	Sunil	32	I	Tulip
3	Ashish	3	II	Sunflower
4	Neha	23	II	Sunflower
5	Himanshu	20	III	Tulip
6	Nidhi	22	III	Tulip
7	Palvi	30	III	Jasmine
8	Anil	1	IV	Rose
9	Roshan	35	V	Rose

Fig. 5.7 Multiple level sorting

Akriti observes that the worksheet is arranged in the ascending order of Class (column C) and in a particular class, the roll numbers are also arranged in the ascending order. Priti tells her that this is called multiple level sorting and it allows us to select more than one sorting criterion.

'How will it help you?' Akriti asks her sister.

'As you can see, now I can see the roll numbers of all the participants of a class and that too in the ascending order,' Priti tells her.

'Wow!' exclaims Akriti.

Remember

If you need to change the order of a multilevel sort, it's easy to control which column is sorted first. Simply select the desired **column**, then click the **Move Up** or **Move Down** arrow to adjust its priority.

Filtering Data

'What next?' asks Akriti.

'Let me now show you how to filter the data,' Priti tells Akriti.

AutoFilter

Priti now explains to Akriti that the basic Excel filter (also known as the Excel AutoFilter) allows us to view specific rows in an Excel spreadsheet, while hiding the other rows. She gives Akriti an example:

'Suppose I want to see all the participants of the house Tulip. We need to apply filtering for that. This is how we can do it.'

Akriti now follows these steps to apply AutoFilter:

AutoFilter filters all columns in a worksheet, according to the values that you select in a column.

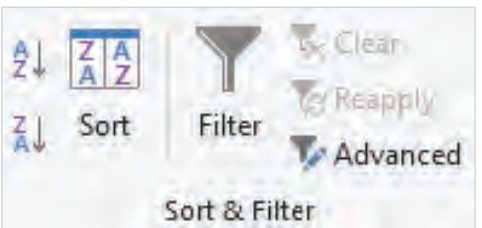


Fig. 5.8 Sort & Filter group

1. She first goes to the **Data** tab.
2. She then selects a cell and clicks on the **Filter** option. Akriti notices a down-arrow appearing in each column heading.
3. She clicks on the down-arrow next to the House heading. A dialogue box appears.
4. She then clicks on the **Select All** option to deselect all the options.
5. She checks the **Tulip** option. After that, she clicks on **OK**.

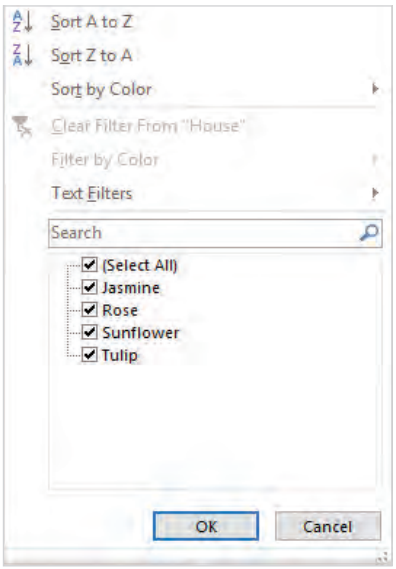


Fig. 5.9 Selecting the criteria for AutoFilter

Quick Tip

Right-click on the Filter button. Choose Add to Quick Access Toolbar to add Filter to the toolbar.

The data gets filtered as shown in Fig. 5.10.

	A	B	C	D
1	Name	Roll no.	Class	House
2	Sunil	32	I	Tulip
5	Himanshu	20	III	Tulip
6	Nidhi	22	III	Tulip

Fig. 5.10 Worksheet with filtered data

Quick Learn

Open the worksheet 'word meanings' again. Use the AutoFilter option and find out the number of adjectives, nouns, and verbs.

Priti tells Akriti, 'See, I can now see only the participants of the house Tulip. Filtering is more useful when dealing with data that contains a long list.'

Removing a Filter

Priti now tells Akriti how we can remove a filter.

- To remove an applied filter, click on **Clear** in the **Sort & Filter** group.

Clicking on the **Reapply** option applies the last filter again.

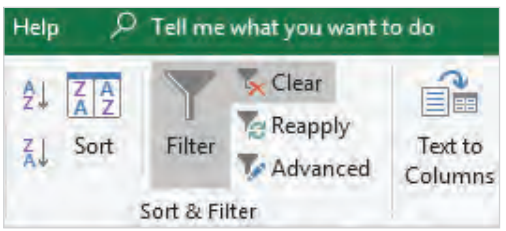


Fig. 5.11 Removing a filter

Custom Filtering

Priti now tells Akriti that Excel also allows us to search for exact words, phrases, dates, or numbers and apply filters on them.

'It narrows down your search and helps us find exactly what is needed,' she tells Priti.

Priti then shows Akriti how filters can be applied to extract the data of the students with roll numbers greater than 20 and less than 30. She follows these steps.

1. She applies filters to the heading cells and then clicks on the down-arrow next to the heading 'Roll no.'.
2. She now asks Akriti to hover the mouse over the **Number Filters** option and select the **Custom Filter** option from the submenu.
3. The **Custom AutoFilter** dialogue box opens. Priti helps Akriti in choosing the appropriate operators and filling in the values.
4. She then clicks on **OK**.

Did You Know?

In the Custom AutoFilter dialogue box, the 'And' radio button is used to combine two conditions and displays the results if both the conditions are met.

The 'Or' radio button combines two conditions and displays the results even if one of the conditions is met.

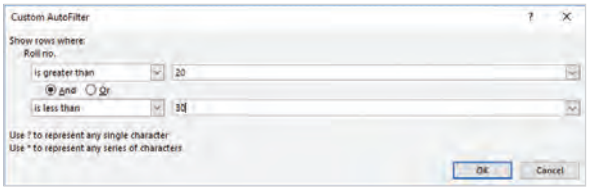


Fig. 5.12 Custom AutoFilter dialogue box

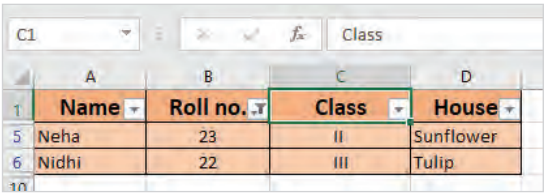


Fig. 5.13 Worksheet after applying Custom AutoFilter

Text Filter

Akriti has understood how to narrow down her search results in Excel using filters. Priti now comes up with a question for Akriti, 'Can you show data of students whose names start with "A"?'

'No, but I am curious to know,' answers Akriti.

Priti then explains to her the following steps.

1. Apply filter and click on the down-arrow button next to the heading 'Name'.
2. Hover the mouse over the **Text Filters** and select the **Begins with** option.
3. The **Custom AutoFilter** dialogue box opens.Type 'A' or 'a' in the box next to the 'begins with' box.
4. Click on **OK**.

The worksheet will show only the rows where the names of the students begin with 'A'.

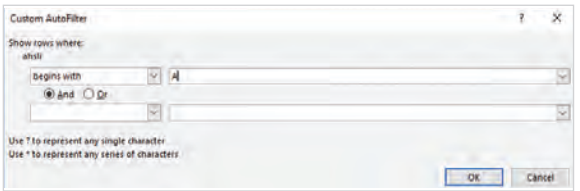


Fig. 5.14 Custom AutoFilter dialogue box

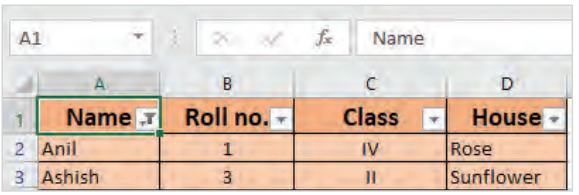


Fig. 5.15 Worksheet after applying Text Filter

Conditional Formatting

'There is one more interesting feature that is yet to be explained to you,' says Priti.

'What's that? I am curious to know,' tells Akriti.

'Conditional formatting, which is a feature that allows us format our worksheet based on the condition we specify,' tells Priti.

'It looks quite interesting. Let us try out the steps,' says Akriti.

'Let us suppose we want to highlight those records of the students whose roll numbers are greater than 28,' tells Priti.

Priti then guides Akriti through these steps.

1. Select the range of the data.
2. Locate the **Styles** group on the **Home** tab and click on the **Conditional Formatting** drop-down arrow.
3. Now point to **Highlight Cell Rules** and select the **Greater Than** option.
4. Enter the value as 28 and select the formatting condition from the drop-down list.
5. Click on **OK**.

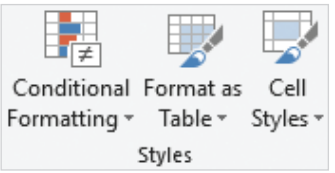


Fig. 5.16 Styles group

The cells will be highlighted in the worksheet.

Fig. 5.17 Greater Than dialogue box

H18

	A	B	C	D
1	Name	Roll no.	Class	House
2	Anil	1	IV	Rose
3	Ashish	3	II	Sunflower
4	Himanshu	20	III	Tulip
5	Neha	23	II	Sunflower
6	Nidhi	22	III	Tulip
7	Palvi	30	III	Jasmine
8	Roshan	35	V	Rose
9	Sunil	32	I	Tulip

Fig. 5.18 Formatted worksheet

Highlighting Selected Rows

Priti tells Akriti that there is one more way to apply conditional formatting.

'You can highlight the rows meeting the specified condition,' says Priti.

She then shows to Akriti the steps to highlight those rows where the roll numbers are greater than 30.

1. Select the data range.
2. Click on the **Conditional Formatting** command and select the **New Rule** option. The **New Formatting Rule** dialogue box opens.
3. Click on the **Use a formula to determine which cells to format** option in the **Select a Rule Type** box.

4. Under the **Format values where this formula is true** heading, type the address of the cell for which you need to specify the condition. Akriti types '=$B2>28' in the box.
5. Click on the **Format** button. The **Format Cells** dialogue box opens.
6. Click on the **Fill** tab and choose the desired colour. Click on **OK**.
7. The **New Formatting Rule** dialogue box appears again. Click on **OK**.

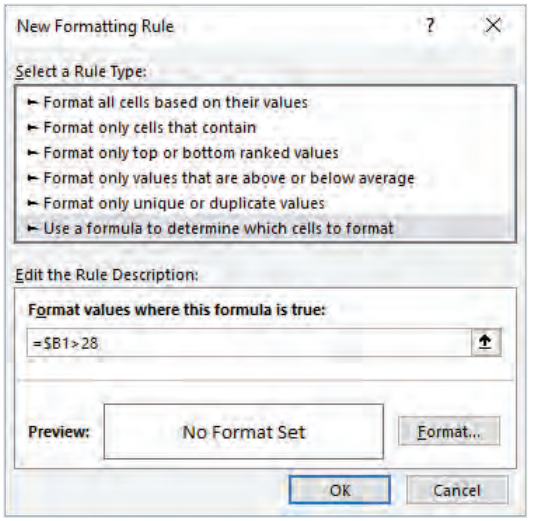

New Formatting Rule
Select a Rule Type:
Format all cells based on their values
Format only cells that contain
Format only top or bottom ranked values
Format only values that are above or below average
Format only unique or duplicate values
Use a formula to determine which cells to format
Edit the Rule Description:
Format values where this formula is true:
=$B1>28
Preview:
No Format Set
Format...
OK
Cancel

Fig. 5.19 New Formatting Rule dialogue box

	A	B	C	D
1	Name	Roll no.	Class	House
2	Anil	1	IV	Rose
3	Ashish	3	II	Sunflower
4	Himanshu	20	III	Tulip
5	Neha	23	II	Sunflower
6	Nidhi	22	III	Tulip
7	Palvi	30	III	Jasmine
8	Roshan	35	V	Rose
9	Sunil	32	I	Tulip

Fig. 5.20 Formatted Worksheet

Removing Conditional Formatting

While exploring the options under the Conditional Formatting command, Akriti comes across the Clear Rules option. She hovers the mouse over it and notices two options—**Clear Rules from Selected Cells** and **Clear Rules from Entire Sheet**. She selects the **Clear Rules from Entire Sheet** option and all the conditional formatting rules get removed from the sheet.

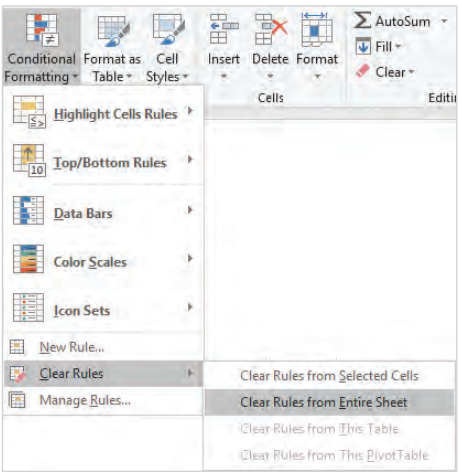


Fig. 5.21 Clear Rules submenu

Checkpoint

Answer the following questions.

1. What is sorting? Write the steps to arrange data in a descending order.
2. What do you understand by filtering?
3. List the steps to filter data.
4. How is conditional formatting useful?

Key Terms

Data Sorting	Arrangement of the given data according to a particular field, either in ascending or descending order
Data Filtering	A quick and easy way to find and work with a subset of data that meets specific criteria
Custom Filtering	To apply multiple conditions to filter data
Conditional Formatting	Applying formatting based on the conditions given by the user

Recap

- Excel provides you the option of sorting data, which involves rearranging data according to our preferences.
- Data can be arranged in descending or ascending order.
- Filtering data helps you to display only the rows and columns that meet the criteria we specify.
- Conditional formatting lets you format cells according to the conditions specified by the user.

Exercise

A. Choose the correct options.

1. We can sort data by first clicking on

   a) the Data tab. b) the Home tab. c) a) or b). d) the View tab.

2. Which of the following groups has the Sort & Filter option under the Home tab?

   a) Alignment b) Number c) Styles d) Editing

3. Which of the following commands should be clicked to remove an applied filter?

   a) Advanced b) Clear c) Reapply d) None of these

4. Which of the following has the Add Level and Delete Level buttons?

   a) The Sort & Filter group b) The Sort dialogue box

   c) The Filter options list d) The Custom Filter dialogue box

5. Which tab will you click to apply filter on the data?

   a) Data b) Formulas

   c) Review d) View

B. State *true* or *false*.

1. Filters are used to hide data.
2. The Sort command is available under the Data tab.
3. You must have the column selected that you want to sort before you click on the Sort command.
4. Sort A to Z means arranging data from highest to lowest.
5. Custom filtering lets you format cells based on a specific condition.

C. Fill in the blanks.

1. The Conditional Formatting command is available under the _____ tab.
2. _____ involves arranging the given data according to a particular field, either in ascending or descending order.
3. To sort a column alphabetically, the Order box must be set to _____.
4. Using the _____ command is the quickest way to remove all the Filters that have been applied to a worksheet.
5. You will point to the _____ option to remove the conditional formatting.

D. Answer the following questions.

1. Differentiate between filtering and sorting data.
2. What is the advantage of sorting data?
3. List the steps for sorting data.
4. How are filters useful in managing a large amount of data?
5. How can you remove conditional formatting? Mention the steps.

Application-based Questions

1. The Sports Academy Manager of 'Sprinter Academy' creates a worksheet as given below.

Name of the Coach	Age	Date of Joining	Sports	Gender	Group
Sumit Sehgal	35	23 August 2017	Cricket	Male	1
Madhvi	34	12 July 2019	Badminton	Female	2
Karan Singh	28	5 March 2016	Table Tennis	Male	1
Manoj Sharma	36	11 December 2017	Swimming	Male	3
Kritika Desai	41	15 October 2017	Karate	Female	2
Shyama Yadav	27	12 May 2018	Swimming	Female	1
Rajesh Jain	34	7 June 2016	Table Tennis	Male	3
Pankaj Kumar	37	5 March 2018	Karate	Male	1
Meneka Sharma	34	22 September 2018	Basketball	Female	2
Nitin Singh	32	5 May 2017	Cricket	Male	2

Ramesh	34	4 June 2017	Karate	Male	3
Nidhi	37	13 April 2016	Swimming	Female	2
Rishi	43	12 December 2016	Cricket	Male	3
Ankur	38	2 February 2018	Badminton	Male	1
Mahesh	26	3 September 2017	Swimming	Male	1

a) The manager wants Hemant to sort the list by Sports and then by Group. How can Hemant do this?

b) Hemant needs to select the names of the coaches who have joined last year, but exclude those who are in Group 2. How can he quickly get this list together?

2. Consider the worksheet given below and answer the questions that follow.

	A	B	C	D	E	F	G
1	**Name**	**Department**	**Basic (in ₹)**	**HRA (in ₹)**	**DA (in ₹)**	**PF (in ₹)**	**Net Salary (in ₹)**
2	Samarth	Sales	40000	7000	11750	7000	51750
3	kanika	IT	20000	4000	6000	3000	27000
4	Ishpreet	Editorial	22000	6000	7000	3000	32000
5	Mahima	Procurement	17000	3000	5000	2500	22500
6	Gunjan	Production	33000	5000	9500	6000	41500
7	Priya	Production	32000	5000	9250	6000	40250
8	Deepak	IT	17000	3000	5000	2500	22500
9	John	IT	18000	3000	5250	2500	23750
10	Junaid	IT	11000	2000	3250	1500	14750
11	Gurpreet	Editorial	22000	6000	7000	3000	32000
12	Sunil	Sales	20000	4000	6000	3000	27000

a) Highlight those records whose Net Salary is less than ₹25,000.

b) Show only the records whose names start with 'J' and the Net Salary is greater than ₹12,000.

Lab Activity

1. Sania has a worksheet that contains the time taken by 25 swimmers in a swimming competition for each of the four rounds. The four sets of timings are in the cells B2–B26, C2–C26, D2–D26, and E2–E26 respectively. List the steps for each of the following tasks:

   a) Filter the data according to the average time taken by the swimmers. Display the shortest time first.

   b) Show only those swimmers who could swim in an average time of 25s.

2. Minisha's father owns a supermarket store. With the help of her father, she creates a worksheet showing sales of different items.

	A	B	C	D	E
1	**Item**	**Item ID**	**Date**	**Amount (in ₹)**	**City**
2	Air conditioner	A0023	28-08-2018	50000	Delhi
3	Car upholstery	A0012	29-08-2018	70000	Chennai
4	Heater	A0013	30-08-2018	35000	Mumbai
5	Washing machine	A0020	31-08-2018	200000	Agra
6	Curtains	A0018	25-09-2018	15000	Delhi
7	Chair	A0010	26-09-2018	19000	Mumbai
8	Table	A0017	13-09-2018	18000	Chennai
9	Water bottle	A0002	22-10-2018	1000	Delhi
10	Fab	A0003	17-10-2018	48000	Bengaluru
11	Sewing machine	A0015	05-10-2018	67000	Bengaluru
12	Light	A0016	10-11-2018	98000	Delhi

Observe the worksheet and help Minisha in doing the following tasks.

a) Sort the worksheet depicting the most recent sales on the top.

b) Highlight the items whose amounts are greater than ₹50,000 and less than ₹70,000.

c) Highlight the records of the orders placed in the month of September and in Mumbai.

Project

Create an Excel file ‘Students detail’. The file will contain columns Admission number, Roll number, Name, Class, Date of Birth, Gender, Address, Mobile no., Bus route, House, and Percentage. Now carry out the following tasks.

a) Sort the database in the ascending order of Class.
b) Add a level to the sort, and sort it by the Roll number.
c) Display the record of the girls going in bus route number 3 by applying filter on the columns Gender and Bus route.
d) Clear the filter.
e) Apply filter on the column ‘Class’ and then ‘Percentage’ to view the details of the students of class 6 whose percentage is between 80 and 90.

Explore More

- Try to find out about different number, text, and date filters.
- Find out the types of tasks where filters are most commonly used.

Weblinks

- https://www.gcflearnfree.org/excel2016/sorting-data/1/
- https://www.gcflearnfree.org/excel2016/filtering-data/1/

Work Wisely

Do not open or change the data of an Excel sheet created by someone else. Find out how to prevent someone from changing the content in your worksheet.

Notes for the Teacher

Encourage students to explore various ways of sorting and filtering data. Ask them to find out some data in their maths and science books and create worksheets based on that.

6 Introduction to GIMP

After going through this chapter, you will be able to—

- **identify** the features and functions of GIMP;
- **identify** situations in which GIMP can be used;
- **work** with images in GIMP; and
- **make** use of some of the basic tools of GIMP.

Rebecca has learnt about various parts of a plant in her class today. At home, she starts revising what her teacher taught her. She makes the following notes in her exercise book.

The plant body has two systems—the root system and the shoot system.

- The roots help the plant in absorbing water from the soil and also making the plant stand firmly on the ground.
- The shoot system consists of stem, leaves, and flowers.

The flower is the most colourful part of a plant. Flowers have colourful petals to attract insects. The petals in a bud are enclosed inside sepals. Sepals are the green leaf-like structures that provide protection to the flower when it is in a bud stage.

At home, Rebecca searches the internet for an image of a flower. She comes across a few images. She selects an image and downloads it on to her computer.

Rebecca wants to label the image in MS Paint. She also wants to make certain changes in the image. She asks her mother to help her. Her mother is a graphic designer. She tells Rebecca that an image can be modified using an image editing software.

'What is image editing software?' Rebecca curiously asks her mother.

Her mother replies, 'Image editing is modifying an image to improve its overall quality. It helps you do several enhancements to make an existing image more valuable and attractive. It also allows you to make changes to the image.'

She explains further, 'Nowadays, image editing software is used everywhere—whether you are creating a web interface, designing a poster, or simply cropping and enhancing your family photos. Some widely used image editing software programs are Adobe Photoshop, GIMP, Inkscape, and Fireworks.'

‘Which software program should we use to modify this image?’ Rebecca asks.

‘Let’s use GIMP here,’ her mother replies.

In this chapter, you will see how Rebecca was introduced to the fascinating image editing software—GIMP. This chapter will make you familiar with various tools of GIMP and make you ready to use image editing software programs.

What is GIMP?

Rebecca’s mother first tells her what GIMP is. This is what she explains to Rebecca:

GIMP is an acronym of GNU image manipulation program. It is an open-source software program, which can be freely downloaded from the internet. It can be used for tasks such as editing and retouching an image, converting an image from one format to another, and drawing free-form images.

GIMP was originally named ‘general image manipulation program’. It was developed by Spencer Kimball and Peter Mattis in 1995 as a college semester project. Its first version was officially released in 1996. It is available for Windows, Linux, and macOS.

Did You Know?

An **acronym** is an abbreviation formed from the initial letters of the words that form the name of something. For example, UNICEF (United Nations International Children Emergency Fund).

A **recursive acronym** is an acronym that refers to itself. GNU stands for GNU’s Not Unix, and thus it is a recursive acronym.

Starting GIMP

Rebecca’s mother has already installed GIMP on her computer. She clicks on the **Start** button and then clicks on the **GIMP2** icon. She tells Rebecca that we can also open GIMP by just typing GIMP in the search bar and clicking to open it.

She shows the GIMP window to Rebecca as shown in Fig. 6.2.

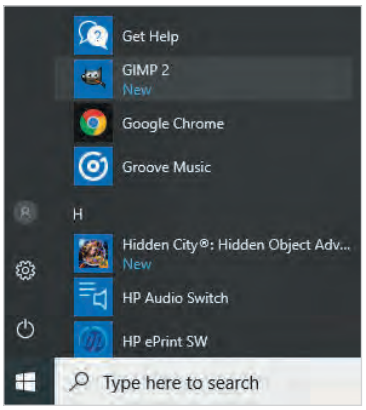


Fig. 6.1 Starting GIMP

Fig. 6.2 GIMP window

Opening an Image in GIMP

To start working with GIMP, Rebecca needs to open an image. Her mother guides her through these steps:

1. She clicks on the **File** menu and selects the **Open** option.

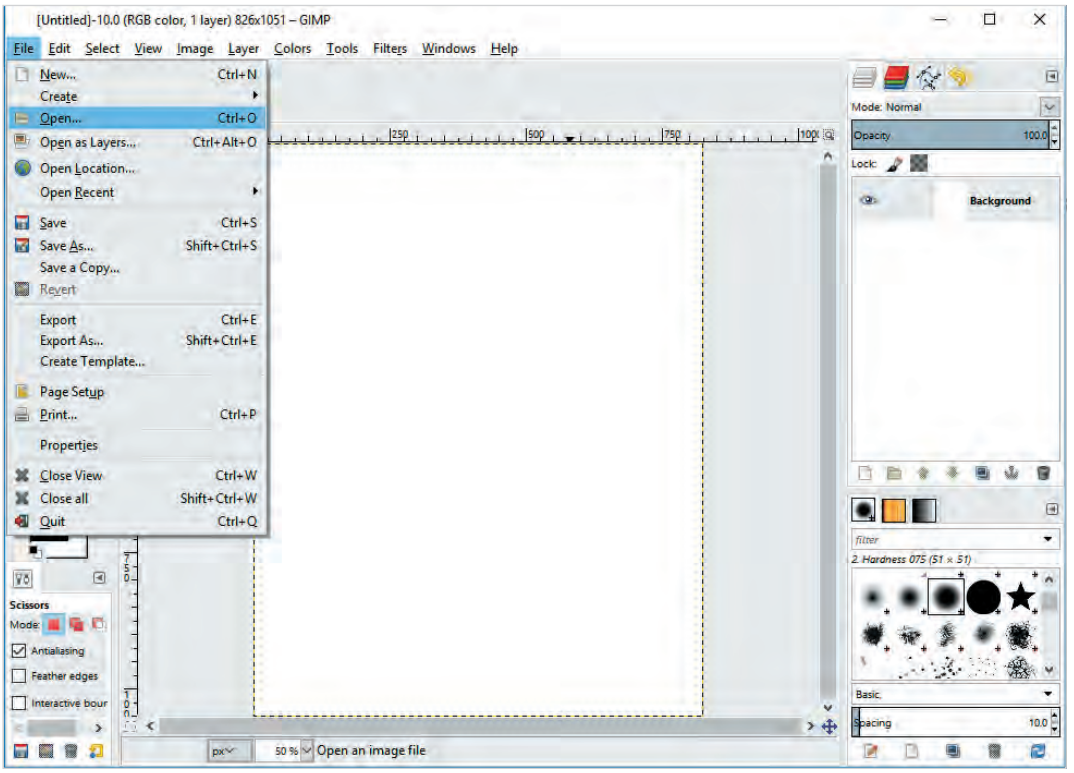


Fig. 6.3 File menu—selecting the Open option

2. The **Open Image** dialogue box appears. Rebecca chooses the location where the image is saved.
3. She selects the image of the flower and clicks on the **Open** button.

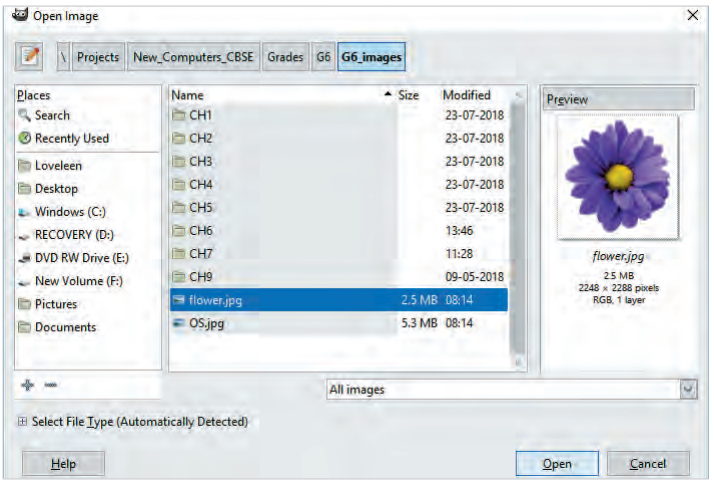


Fig. 6.4 Open Image dialogue box

Remember

You can switch from a multi-window mode to a single-window mode by clicking on the Windows tab and then selecting the single-window mode.

The selected file opens up in GIMP.

Components of the GIMP Interface

Rebecca's mother now starts talking about the various components of the GIMP window to Rebecca. She tells Rebecca that the GIMP interface is divided into three parts—the main window, the toolbox, and the layers window.

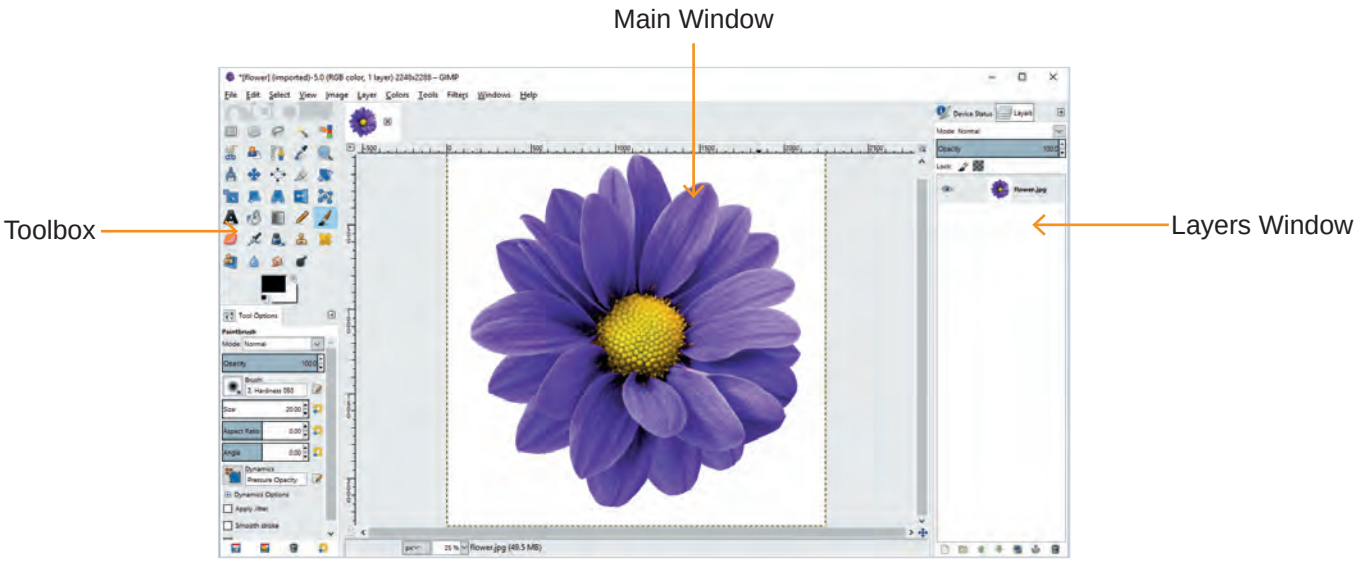


Fig. 6.5 Components of the GIMP window

Main Window

Rebecca's mother tells her that when we open an image, it is shown in the main window. She also notices that the main window has several menus. Her mother tells her that each menu has some commands to perform the actions. Rebecca starts exploring these menus with the help of her mother.

Toolbox

'See, Rebecca. Here is the Toolbox to the left of the main window,' Rebecca's mother tells her. She then explains to Rebecca that the Toolbox offers us a variety of tools that help us draw, edit, or manipulate images.

Rebecca notices that there are five types of tools—Selection, Brush, Colour, Transform, and Miscellaneous.

Layers Box

Rebecca locates the Layers box on the GIMP window.

'What are layers, Mom?' Rebecca asks her mother.

Her mother explains that an image is made up of various components and these components are called layers.

'Imagine several photos stacked on top of each other. Then think of these photos together making up a single image.

Quick Learn

Start GIMP on your computer. Ask your elders or your teacher to provide you an image. Try various tools to edit and manipulate that image. Save the image each time you make a change with a different name.

These several photos are layers,' Rebecca's mother goes on to explain.

She emphasizes that in image editing, we often work on layers.

'Now I have understood. Splitting an image into layers is called layering,' Rebecca tells her mother.

'Great! The Layers box lets us manage the layers, brushes, gradients, and patterns used over images,' says her mother.

Selection Tools

Rebecca's mother now tells her about selection tools. She tells Rebecca that often when we work on an image, we only want a part of it to be modified, and GIMP lets us select that part.

Remember

Selection tools are mainly used to select an area of an image or the whole image.

Rectangle Select Tool

Rebecca's mother tells her that the Rectangle Select Tool is used to select a square or rectangular area in an image. She asks Rebecca to follow these steps:

1. Select the **Rectangle Select Tool** from the toolbox.
2. Draw out a rectangle or square of any size on the image by clicking and dragging the left mouse button.
3. A rectangular border appears around the selected area.

Ellipse Selection Tool

Now Rebecca is able to locate the Ellipse Selection tool from the toolbox, which is used to select elliptical or circular areas in an image. But she has to click and drag the mouse pointer while holding the left mouse button. This creates a dashed border around the selected image.

Quick Tip

Use the key E as the shortcut to select the Ellipse tool.

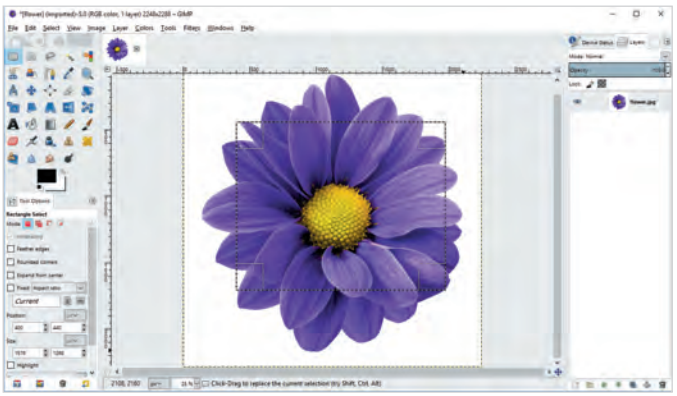


Fig. 6.6 Rectangular selection

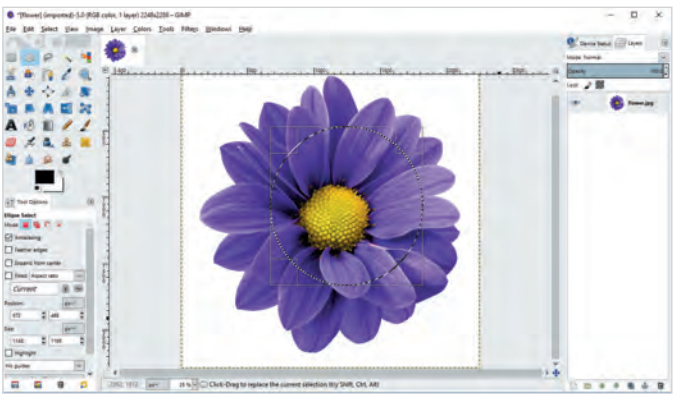


Fig. 6.7 Ellipse selection

Free Select Tool

Rebecca's mother tells her that the Free Select tool is used to create a selection by drawing it freehand using the mouse pointer.

Rebecca is quick to select the **Free Select** tool. She then clicks and drags the mouse pointer and selects the area while holding the left mouse button. Her mother asks her to release the mouse button. This makes the selected area get closed from the current pointer location to the start location.

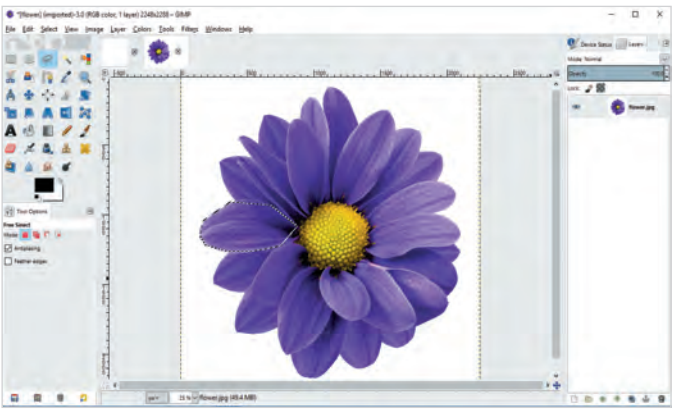


Fig. 6.8 Free selection

Fuzzy Select Tool

'This is the Fuzzy Select tool. This enables you to select areas of similar colour range,' Rebecca's mother tells her.

She further tells Rebecca that this tool first identifies the colour of the area at which we click on and then selects all the areas of that colour.

Quick Tip

To deselect a selection, press Ctrl + Shift + A.

Tool Options

'When a tool is selected, the Tool Options window appears on the left side (under the toolbox),' Rebecca's mother tells her.

She explains to Rebecca that the tool options available for the Rectangle Select tool, Ellipse Select tool, and Fuzzy Select tool are the same. She further tells Rebecca that for the Free Select Tool, only three options are available, Mode, Antialiasing, and Feather edges, and these are similar to the Rectangle Select tool options.

Rebecca's mother now shows to her all the tool options.

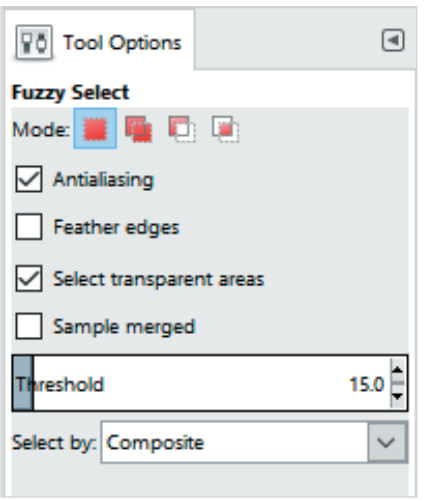


Fig. 6.9 Tool options

1. **Mode:** There are four modes of selection for the Rectangle Select tool as listed below:
   - **Replace the current selection**—replaces the current selection if a new selection is made

- **Add to current selection**—adds the new selection to the current selection
- **Subtract from current selection**—subtracts the new selection from the current selection
- **Intersect with current selection**—creates a new selection area where the new selection region and current selection region overlap

2. **Antialiasing:** It makes the boundary of the selection very smooth.
3. **Feather edges:** This option makes the boundary of the selection blurred.
4. **Select transparent areas:** This option selects those areas that are completely transparent.
5. **Threshold:** This option determines the range of colours that will be selected on clicking at the initial point. The higher the value of threshold, the larger is the resulting selection.
6. **Select by:** This option lets you select the component of the image GIMP shall use to find the similar colours. The options are red, green, blue, hue, saturation, and value.

Checkpoint

Choose the correct options.

1. What is the full form of GIMP?
   a) GNU image management program b) GNU image manipulation program
   c) GNU image match program d) GNU image modify program
2. Which of the following tools can be used to change the size of an image in GIMP?
   a) Miscellaneous b) Selection c) Transform d) None of these
3. Which of the following tool options makes the boundary of a selection smooth?
   a) Feather Edges b) Antialiasing c) Guides d) Expand from center
4. Which of the following tool lets you create a selection by drawing it with the mouse pointer?
   a) Free Select b) Rectangle Select c) Ellipse Select d) Fuzzy Select

Paint Tools

Now Rebecca's mother comes to the Paint tools. She tells Rebecca that these are used to edit and retouch an image, and these can also be used for drawing.

Pencil Tool

As Rebecca is familiar with MS Paint, she was quick to learn that the Pencil tool in GIMP is also used for freehand drawing.

'I can draw any shape I like using this tool just like I do with a pencil,' Rebecca tells her mother.

Quick Tip

If you want to draw straight lines with the Pencil (or any of several other paint tools), click at the starting point, then hold down the Shift key, and click at the ending point.

She then shows to Rebecca how the Pencil tool is used.

1. She opens a new blank canvas.

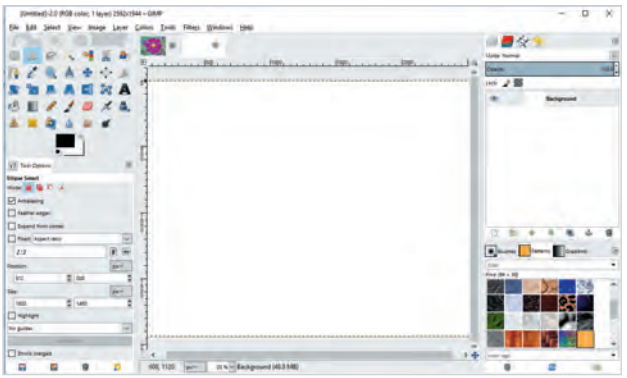


Fig. 6.10 New blank canvas

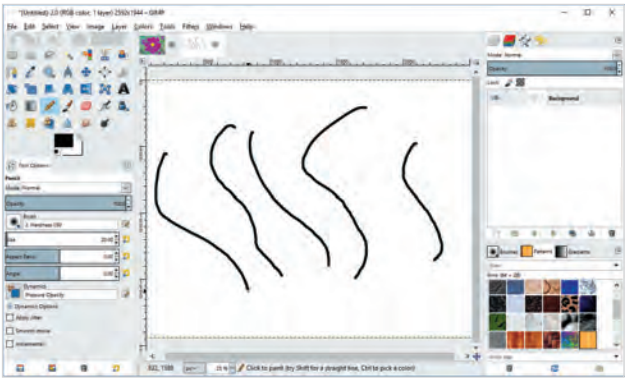


Fig. 6.11 Using the Pencil tool

2. She selects the **Pencil** tool. The mouse pointer changes to a pencil.
3. She draws on the canvas by clicking and dragging the mouse pointer.

Rebecca's mother tells her, 'In GIMP, you will find different tool options of the Pencil tool. This is something which is not there in Paint.'

She shows all the tool options to Rebecca as discussed further.

1. **Mode:** It provides a drop-down list of various paint-mode options.
2. **Opacity:** It is used to set the transparency of the pencil tool. The higher the opacity value is, the more the transparency will be.
3. **Brush:** It lets you set the type of the brush.
4. **Size:** This option lets you set the size of the brush. The more the value of the size is, the bigger the tool in use will be.
5. **Aspect Ratio:** It is the ratio between the height and the width of the brush. A negative value will reduce the height of the brush, while a positive value will reduce the width of the brush.
6. **Angle:** It makes the tool turn round its centre. This is visible in case of non-circular brushes.
7. **Smooth Stroke:** This option, when enabled, lets you draw smooth strokes. When it is checked, two new options, weight and height, appear. The higher the height value, the firmer is the brush stroke.

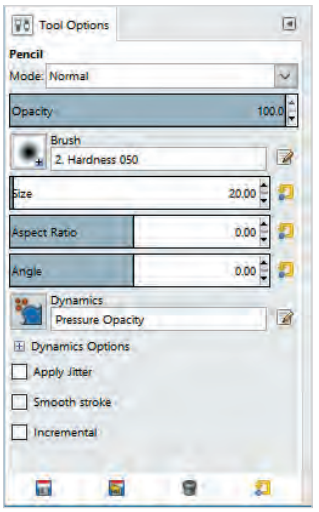


Fig. 6.12 Tool options of the Pencil tool

Paintbrush Tool

Rebecca knows that the Paintbrush tool paints soft-edged lines. She selects the **Paintbrush** tool from the toolbox and moves the mouse pointer over the main window. Now she can draw or write by clicking and holding the left mouse button. This makes her mother happy. She tells Rebecca that the tool options for the Paintbrush tool are similar to the ones described for the Pencil tool.

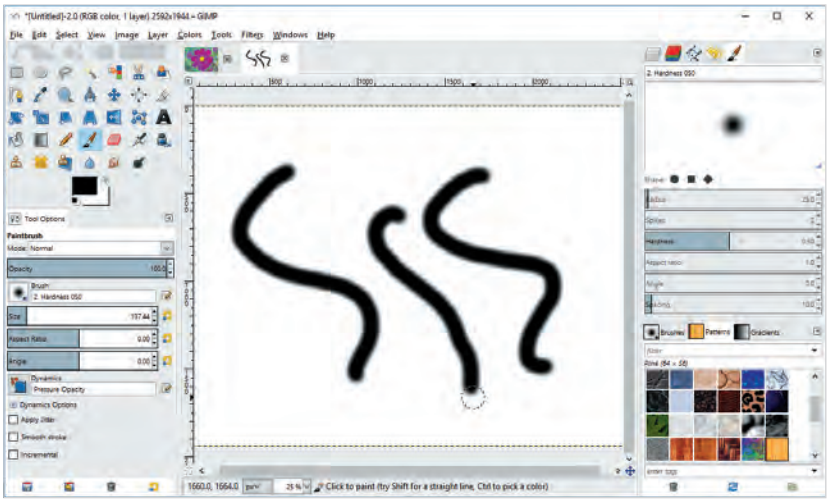


Fig. 6.13 Using the Paintbrush tool

Remember

The Pencil and Paintbrush are similar tools. The main difference between the two is that although both use the same type of brush, the pencil tool will not produce fuzzy edges, even with a fuzzy brush.

Bucket Fill Tool

Rebecca uses the Bucket Fill tool same way as in the MS Paint. She knows that it is used to fill colour or pattern in an area. To show her mother, she uses the Bucket Fill tool following these steps:

1. She draws a shape using the **Pencil** tool and then selects the **Bucket Fill** tool from the toolbox.
2. She then double-clicks on the foreground colour box of the **Foreground & background colors** button. The **Change Foreground Color** box appears.

Quick Tip

- Use the key N as the shortcut to select the Pencil tool.
- Use the Shift and B keys together to directly select the Bucket Fill tool.

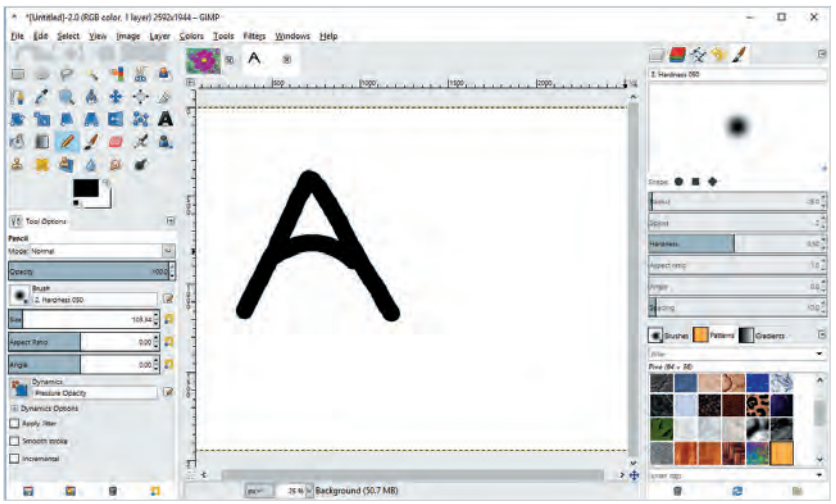


Fig. 6.14 Drawing a shape using the Pencil tool

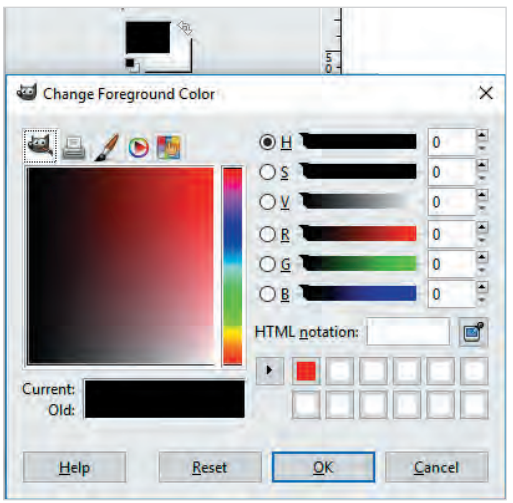


Fig. 6.15 Change Foreground Color box

3. She selects the red colour and clicks on OK.
4. Now she moves the mouse pointer over the area she wants to fill with colour.

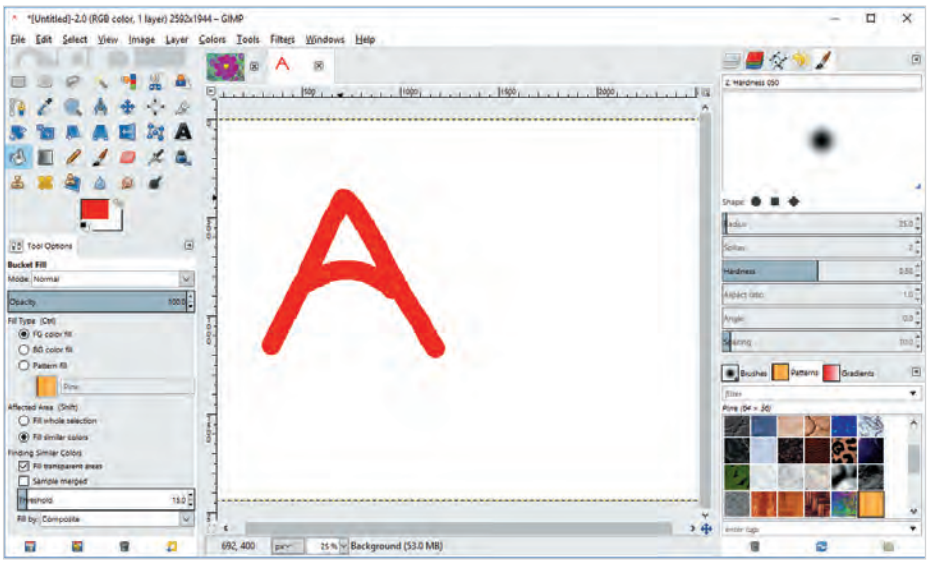


Fig. 6.16 Using the Bucket Fill tool

Tool Options

Rebecca observes the tool options available for the Bucket Fill tool. Besides the Mode and Opacity options, she notices some other tools as well. Her mother elaborates her the options specific to the Bucket Fill tool as given below.

1. **Fill type:** This option lets you select the fill pattern. There are three selections under this option.
   - **FG Color Fill**—sets the currently selected foreground colour as the fill colour
   - **BG Color Fill**—sets the currently selected background colour as the fill option
   - **Pattern Fill**—sets the currently selected pattern as the fill colour
2. **Affected area:** This option selects the area to be filled by the Bucket Fill tool. There are two options under this section.
   - **Fill Whole Selection**—fills the whole selected area with the desired colour; fills the whole canvas if no area is selected
   - **Fill Similar Colors**—selected by default; when clicked, fills the area of similar colour (where you have clicked) with the selected colour (The value of the selection depends on the Threshold option.)

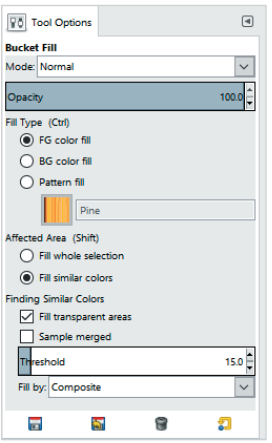


Fig. 6.17 Tool options of the Bucket Fill tool

Eraser Tool

As Rebecca is already familiar with the Eraser tool in MS Paint, she is able to use it easily in GIMP. She begins to understand that there are many points of similarity, and she can use her existing knowledge of other tools to figure out how new tools work.

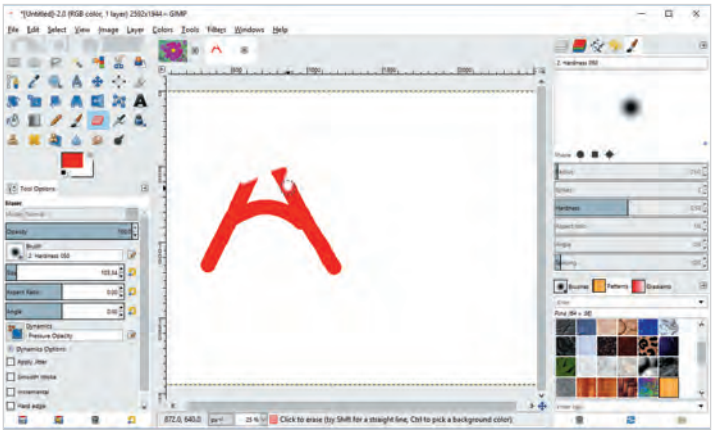


Fig. 6.18 Using the Eraser tool

Quick Tip

Use the Shift and E keys together to select the Eraser tool.

Tool Options

Rebecca's mother now shows her the tool options specific to the Eraser tool and explains to her.

1. **Hard edge:** This option removes the borders of the selected portion without getting rid of the edges.
2. **Anti erase:** This option is used to recover those areas or portions that were removed accidently. It can only be used on layers.

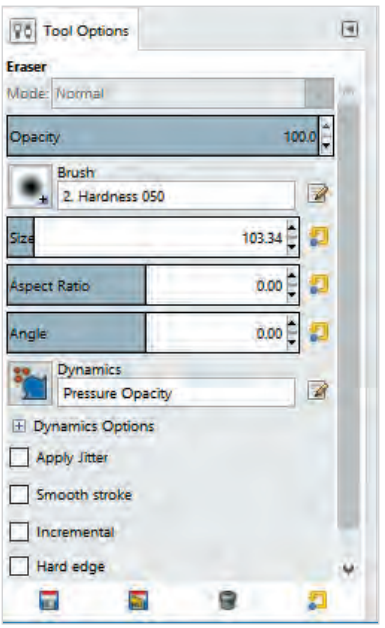


Fig. 6.19 Tool options of the Eraser tool

Creating a New File

Rebecca now wants to create a new file in GIMP to work on a new image. Her mother guides her through these steps:

1. She clicks on the **File** tab and selects the **New** option.
2. The **Create a New image** dialogue box appears. Her mother asks her to set the width and height of the canvas she wants.
3. Rebecca now clicks on the **OK** button.

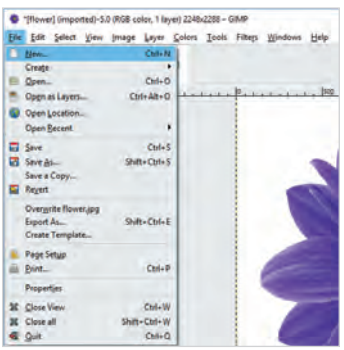


Fig. 6.20 File menu—selecting the New option

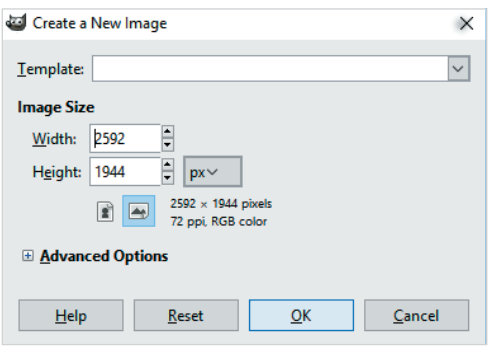


Fig. 6.21 Create a New Image dialogue box

A new white window appears on the screen.

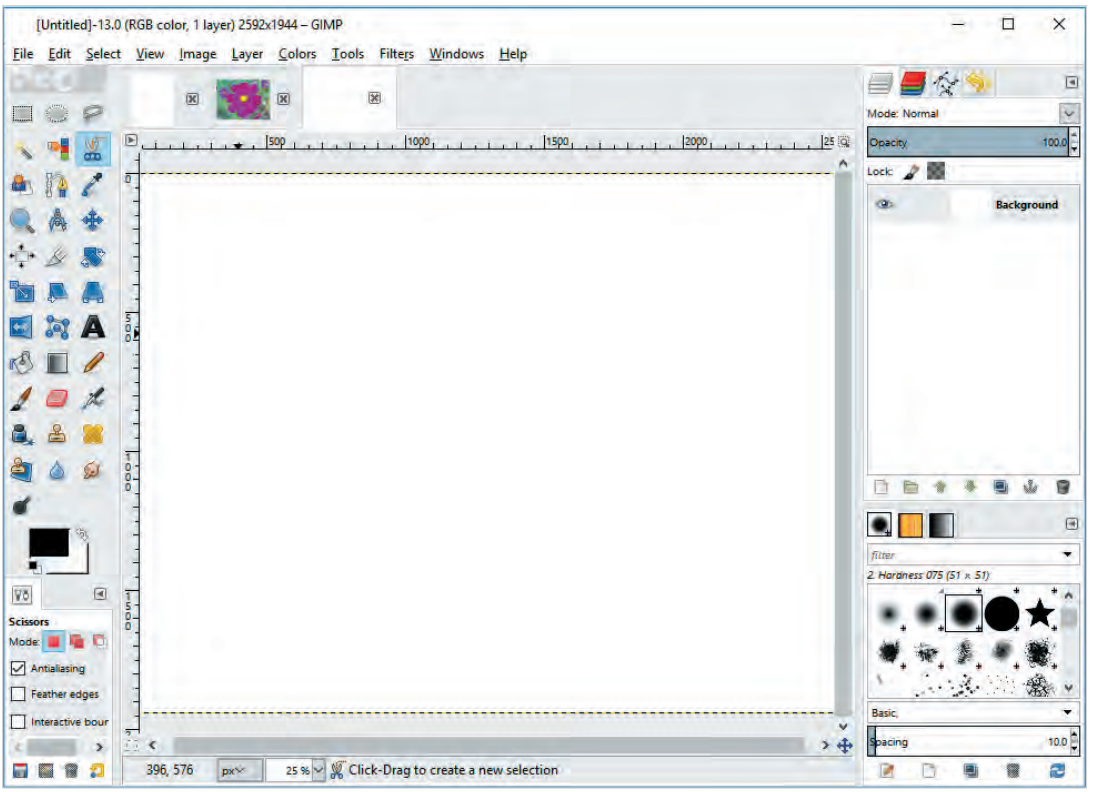


Fig. 6.22 New file in GIMP

Rebecca opens the saved image of the flower in GIMP. She selects an area using the Free Select tool. She then changes the Foreground colour and fills the red colour in the selected area using the Bucket Fill tool.

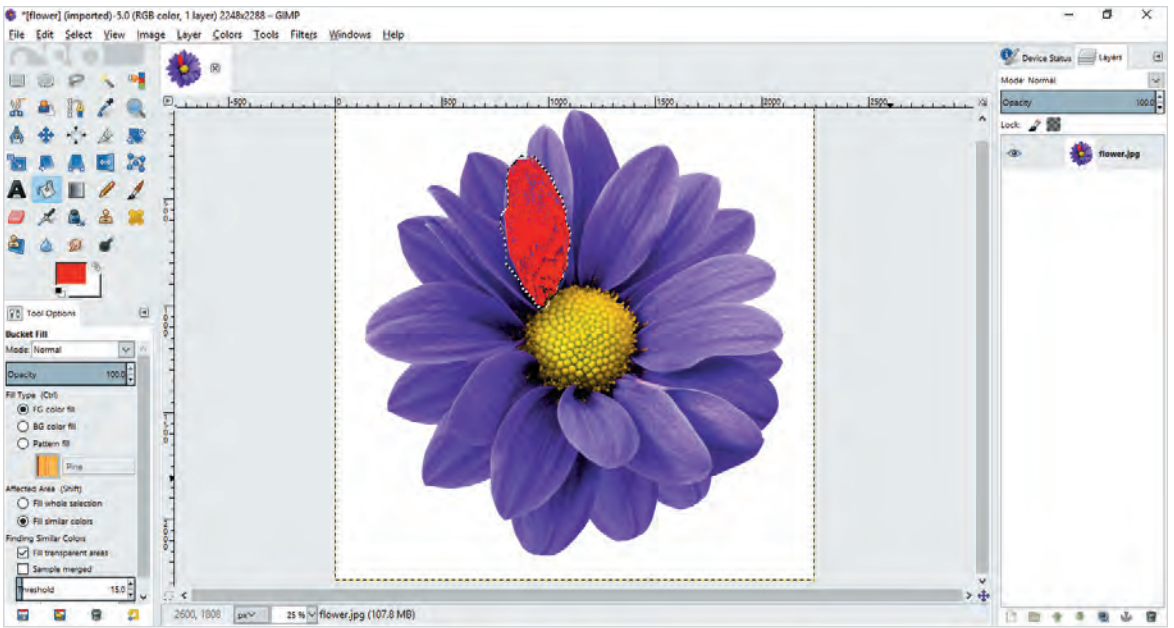


Fig. 6.23 Image being edited in GIMP

Saving a File

As Rebecca is editing the image in GIMP, her mother asks her to save the file. She reminds her that it is always better to save our work so that we can reuse it in the future. She finds that the way to save a file is similar to saving a file in other tools.

Rebecca's mother tells her that GIMP will save that file at the desired location and GIMP files are always saved with an extension of '.xcf'. This tells the operating system that the file was created using GIMP. If Rebecca double-clicks on the file, the operating system will automatically open GIMP and load the file.

Closing a File

It's 5 o'clock in the evening. It's time for Rebecca to go to play football with her friends. Her mother asks her to close the file now. Rebecca clicks on the **File** tab and selects the **Close all** option.

A dialogue box appears with an alert message to save the work. Rebecca's mother tells her that she needs to save the file before closing it. So, she needs to click on the **Cancel** button and save the file.

She tells Rebecca that if she clicks on the **Discard Changes** button, her work will not be saved.

Rebecca is quite happy. She has learnt a new tool of image editing today. She happily goes to play football with her friends in her neighbourhood playground.

Checkpoint

Choose the correct options.

1. Which of the following tools is used to fill colour in an area?
   a) Pencil b) Bucket Fill c) Paintbrush d) Eraser
2. What is the keyboard shortcut to select the Pencil tool?
   a) N b) Ctrl + N c) P d) Shift + P
3. What is the keyboard shortcut to activate the Eraser tool?
   a) Shift + E b) Ctrl + E c) Shift + S d) Ctrl + S
4. Which of the following menus has commands to save a file?
   a) Edit b) View c) File d) Tools

Key Terms

Toolbox	A box containing tools to perform tasks
Download	The process of transferring a file to your local PC
Install	The process of making a program ready for use on a computer (Once a program has been installed, it can then be run.)
Open-source software	Software that is freely available

Recap

- GIMP is an open-source software program used for editing images.
- There are many functions of GIMP, such as editing, retouching, and transforming images.
- The GIMP's main window contains several tabs. Each tab has some commands to perform the actions.
- The Toolbox is located on the left of the main window. It has the following major tools that help us draw, edit, or manipulate images:
  - Selection—used for selecting a part of an image in the shape of your choice
  - Brush—contains different types of brushes to fill an area
  - Colour—used to control the colours of an image
  - Transform—used to transform an image, like changing its size and flip it
- Selection tools include the Rectangle, Ellipse, and Free Select tools.
- Brush tools contain Pencil, Bucket Fill, Paintbrush, Eraser, and many more.

Exercise

A. Choose the correct options.

1. Which tool is used to create a selection by drawing it freehand?
   a) Ellipse b) Rectangle c) Free Select d) All of these
2. Which tool is used to paint soft-edged lines?
   a) Pencil b) Pen c) Marker d) Paintbrush
3. What is the shortcut to select the Eraser tool?
   a) Shift + B b) Shift + E c) E d) E + R
4. Which of the following is a selection tool?
   a) Paintbrush b) Ellipse c) Eraser d) None of these
5. Which of the following tools enables you to select areas of similar colour range?
   a) Paintbrush b) Eraser c) Fuzzy Select d) Pencil

B. State *true* or *false*.

1. You cannot edit a video using GIMP.
2. The Rectangle tool is used to draw a rectangle shape.
3. The Move tool is used to select areas of similar colour range in an image.
4. You can use the Ctrl key to draw straight lines using the Pencil tool.
5. Using the Ellipse Selection tool, you can select circular areas of an image.

C. Fill in the blanks.

1. The _____ tool is used to fill a colour in an area.
2. GIMP is used for _____ an image.
3. The _____ tool fills the whole canvas if no area is selected.
4. The _____ tool is used to paint soft-edged lines.
5. The shortcut key for activating the Pencil tool is _____.

D. Answer the following questions.

1. What are the commonly used Brush tools?
2. Briefly explain the interface of GIMP.
3. List down the categories of the tools available in GIMP.
4. Write three commonly used selection tools in GIMP?
5. Distinguish between the Brush and Color tools.
6. Explain how the Eraser tool in GIMP is used.

Application-based Questions

1. Aman wants to do photo editing for personal use, but he is not sure which software to use. Guide him to select the most appropriate software. Give reasons for the tool you select and any tools that you feel are not appropriate.
2. Akriti is given the task of drawing the human eye in GIMP. Which tool is more suitable for this task—pencil or paintbrush?

Lab Activity

1. Install GIMP on a computer in your lab and do the following tasks:
   - Open a picture of a cake. Use the Rectangular Select tool to select only the image of cake. Copy and paste it in a new file and save it as ‘Birthday’.
   - Now open an image of a flower. Use the Ellipse Select tool to select the flower. Copy and paste it in the file ‘Birthday’.
   - Use the Free Select tool to select a picture of a butterfly, and paste it in the file.
   - Use the Text tool to write Happy Birthday. Save the file.
2. Create a new file in GIMP. Select the Pencil tool. Set the radius to 5. Select a brush type, and draw a rectangle. Using different brush and radius, draw a square and a triangle. Use the Shift key to draw straight lines. Use the Brush type as star and increase the radius to draw scattered stars. Save the file as ‘Shape’.
3. Open the file ‘Shape’. Fill the square with blue colour. Fill the rectangle and triangle using pattern fill. Save and close the file.

Project

1. Observe your surrounding such as nearby park, school, or bank. Now create a drawing depicting the scene of your surroundings.
2. Select an image from your biology, geography, or history textbook and draw any one of images. Add labels, where appropriate, especially for drawings from biology.

Explore More

- Do research on the remaining Brush tools available in GIMP.
- Find out more about the Color tools available in GIMP.

Weblinks

- https://www.gimp.org
- https://en.wikipedia.org/wiki/GIMP

Work Wisely

Always check for the copyright of an image before using it. You should use only those images that are available for educational purposes.

Notes for the Teacher

- Help students identify different tools in GIMP in the lab.
- Help them understand the use of each tool.
- Provide them a sample image to edit.

7 Introduction to Python

After going through this chapter, you will be able to—

- **use** the Python development environment;
- **write** and execute Python programs;
- **identify** data types;
- **explain** keywords, variables, and identifiers;
- **evaluate** expressions using operators; and
- **make** use of conditional statements.

John studies in class 6 in Acme Public School, Chennai. He is excited today. Sitting in the computer lab, along with his classmates, he is going to learn programming language today. He has gone through the chapter on Computer Languages carefully. The whole class is waiting eagerly for their computer teacher, Ms Vijayalakshmi Arora.

Ms Arora enters the classroom.

'What are we going to learn today?' she asks the class.

'Programming language, ma'am,' the entire class replies together.

In an effort to test the children's understanding of programming languages, Ms Arora asks the class, 'Can someone tell me what a computer program is?'

John swiftly raises his hand and answers, 'Ma'am, a computer program is a set of instructions given to a computer to perform a task.'

'Great John. Which language does a computer understand?'

This time the whole class answers, 'binary language'.

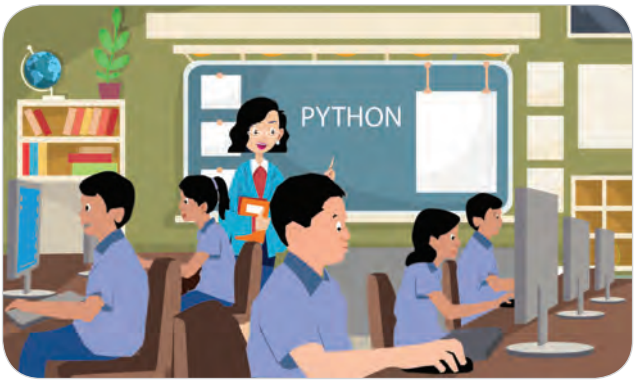
The answer makes Ms Arora happy.

She now tells the class that they are going to learn about a high-level programming language. It's called Python.

Did You Know?

A programming language is used to write instructions for a computer or create software programs.

The class finds the name 'Python' amusing. Ms Arora then shares this interesting story behind the name 'Python' with the class:



Python was developed by a Dutch programmer Guido van Rossum at the National Research Institute for Mathematics and Computer Science (Stichting Mathematisch Centrum) in Netherlands in the early 1990s. When Guido van Rossum began implementing Python, he was also reading the published scripts from "Monty Python's Flying Circus", a BBC comedy series from the 1970s. Van Rossum thought he needed a name that was short, unique, and slightly mysterious, and so he decided to call the language Python.

Python Development Environment

Ms Arora now tells the class that Python's default installation comes with the Python interpreter and an integrated development and learning environment (IDLE). The Python interpreter translates the Python code into a form that a computer can understand. The IDLE is the standard Python development environment. It provides an environment to write and run programs.

Now she starts explaining the IDLE to the class. She tells the children that IDLE works in two modes—interactive and script. She asks them to remember these two points:

- The interactive mode is useful for running a single line of code. It displays the results automatically.
- The script mode lets you work with more than one line of code. You can save the file or script and run the code.

Interactive Mode

Ms Arora now opens IDLE in interactive mode by following these steps:

1. She goes to the Windows **Start** menu and selects **IDLE** (Python 3.6 32-bit).
2. The interactive mode window (Python Shell) appears.

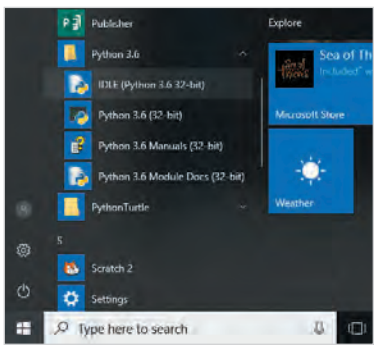


Fig. 7.1 Starting Python

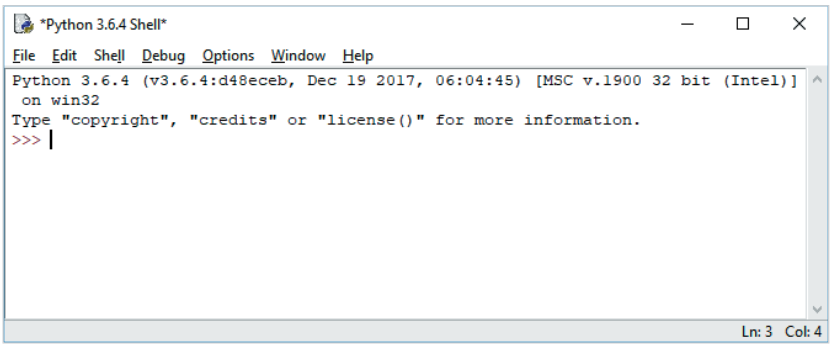

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>>
Ln: 3 Col: 4

Fig. 7.2 Python shell

Ms Arora tells the class that in the interactive mode, the command (instruction) is given at the command prompt (>>>). Further, the command executes when the programmer presses the Enter key.

She then begins writing a program to print the message 'Hello world!'.

1. She types the following line of code on the Python command prompt:

```
>>> print("Hello world!")
```

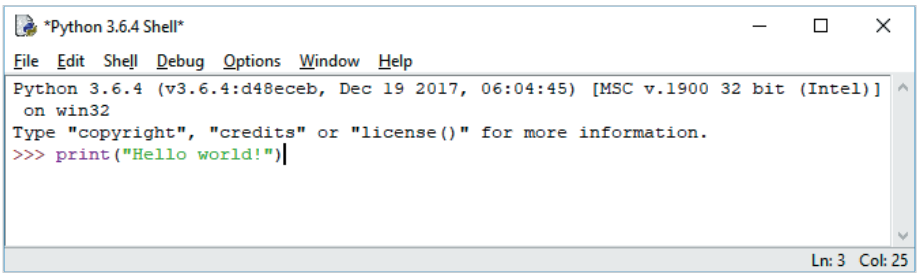

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>> print("Hello world!")
Ln: 3 Col: 25

Fig. 7.3 Writing a program

2. She then asks John to press the **Enter** key. The IDLE displays the following output below the code:

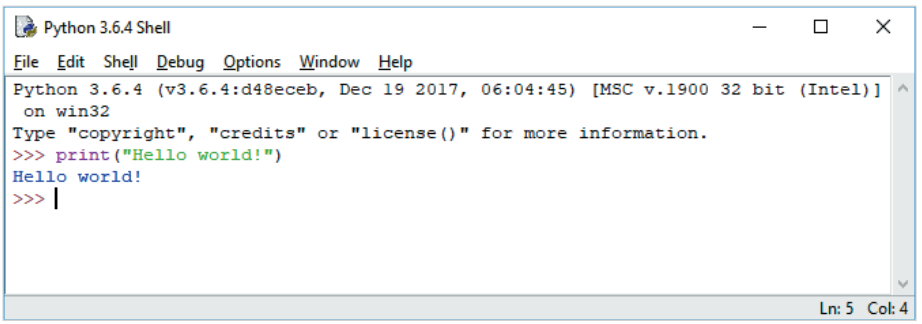

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>> print("Hello world!")
Hello world!
>>>
Ln: 5 Col: 4

Fig. 7.4 Output of the previous program

The whole class is thrilled.

'Ma'am, How do we get the output?' Akanksha asks.

Ms Arora explains it to the class. She tells that in Python, print() is one of the basic functions, which is used to display information on the monitor.

'What is a function, ma'am?' John wants to know.

'A named section of a program that performs a specific task is called function,' Ms Arora answers.

She further elaborates to the class:

- The information that we want to display is given inside the parentheses as input to the print() function—("Hello world!"). The input given is called the argument of the function. Here ("Hello world!") is the argument of the function.
- When the Enter key is pressed, the interpreter interprets the code and displays the following message: Hello world!

Script Mode

Ms Arora now starts the script mode in Python. She follows these steps:

1. She clicks on the **File** menu in the **Python** Shell.
2. She then selects the **New File** option to open the new script window.

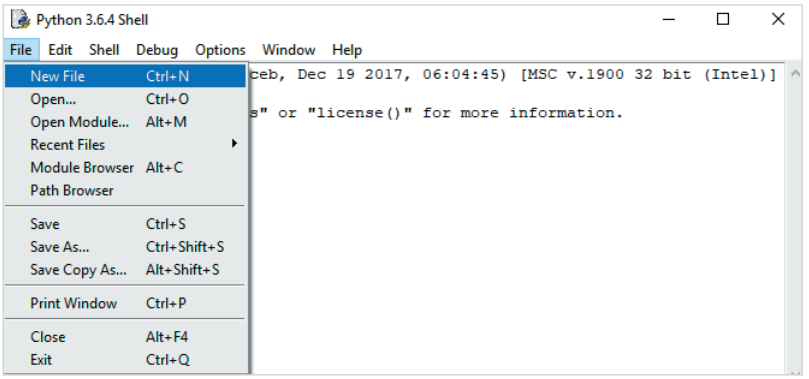
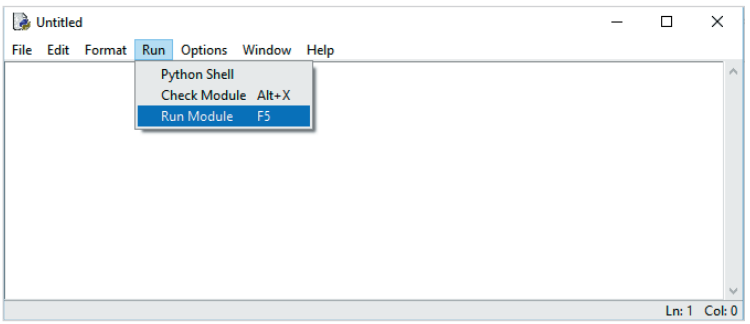


Fig. 7.5 File menu

Ms Arora tells the class that we can write the complete code and save the file. The file is saved with a '.py' extension. To see the output, we run the script by pressing the F5 key. Alternatively, the script can be executed by selecting the **Run Module** option from the **Run** menu.



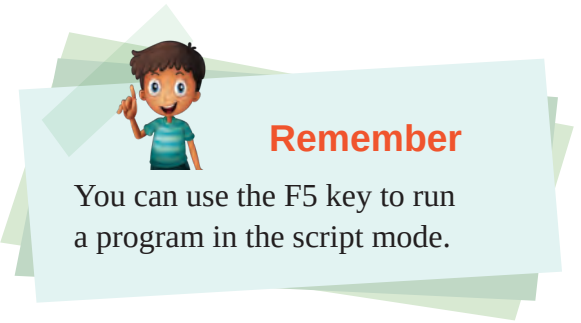


Fig. 7.6 Run command

She now writes a program in the script mode by following these steps:

1. She types the following lines of code in the script window:

```
>>> print("Hello everyone")
>>> print("I'm writing this code using the script mode.")
>>> print("I'm sure you will enjoy coding with Python.")
```

2. She asks Akanksha to save the file with the name 'MyPython1.py'.
3. She asks Amos to press the F5 key to run the program. The output is displayed in the Python Shell as follows.

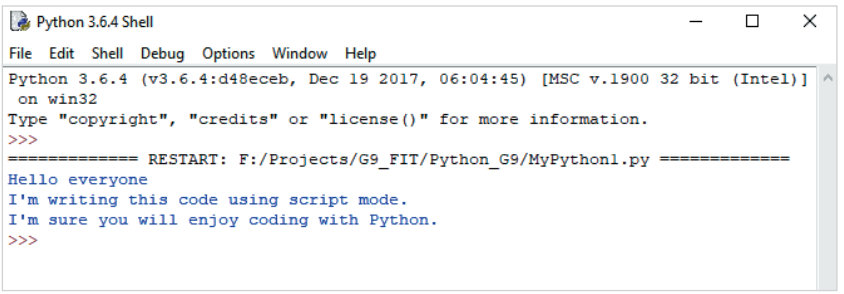

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: F:/Projects/G9_FIT/Python_G9/MyPython1.py ==========
Hello everyone
I'm writing this code using script mode.
I'm sure you will enjoy coding with Python.
>>>

Fig. 7.7 Writing and running a program in script mode

Syntax

The whole class is enjoying learning about Python. Ms Arora helps them open Python in their computers and write codes. But she notices that some of them are not getting the correct output.

Quick Learn

Open Python IDLE and write the statement:

```
print()
```

Run and see the output.

Ms Arora then tells the class that while writing programs, we must follow certain rules, which are called syntaxes. She then explains the rules or syntaxes for using Python:

1. Python is a case-sensitive language. Here, **print()** and **Print()** are not the same. The function **print()** is a predefined function in Python that starts with the lowercase '**p**'.

```
>>> Print("Hello world")      ✗
>>> print("Hello world")      ✓
```

2. If the argument to the print() function is a string (that is, a sequence of characters), it is enclosed within a pair of quotation marks.

```
>>> print(Hello world)        ✗
>>> print("Hello world")      ✓
```

Now the children have understood why they were not getting the correct output. But Ms Arora knows that they need to understand different data types, elements, and operators used in Python. She lets the children write more codes in Python and leaves these topics for the next class.

Data Types

John and his classmates have enjoyed their introduction to the fascinating world of programming. In her next class, Ms Arora has promised them to tell them more about Python.

She decides to begin the class by explaining data types. Each programming language has its native (built-in) data types. Python also has its own set of built-in data types. She then put forth these examples of types of data from real life.

- The name of a person is made up of a combination of the letters of the English alphabet. For example, the name 'Sachin' consists of six letters.
- An address consists of a sequence of characters (letters, numbers, and symbols).
- The age of a person is expressed in numbers. For example, Sachin is 14 years old.
- The gender of a person can be denoted by just one letter—M (for male) and F (for female).

Ms Arora tells the class that in computer programming, data types are used to store different types of data. A particular data type defines the type of operations that can be performed on the data.

She lists out the built-in data types of Python on the whiteboard and describes them with examples.

Data type	Description	Example
Number	It stores numeric values as well as floating-point (decimal) values.	45, 82.5, 282727
String	It stores a combination of letters within the quotation (“ ”) marks.	“Mike”, “School”, “hello”
List	It contains items separated by a comma.	[1, 2, 3, 4], [1, “kc”, 86.5]
Dictionary	It contains keys with their corresponding values.	{‘A’:1, ‘B’:2}
Tuple	It is similar to lists. The only difference is that it cannot be modified and is enclosed by parentheses ( ).	(1, 2, 3, 4)

Elements of Python

After explaining data types, Ms Arora starts elaborating the elements of Python. She lists these on the whiteboard.

- Keywords
- Identifiers
- Variables

Keywords

Ms Arora explains the keywords. She tells the class that keywords are the reserved words in Python that have a special meaning associated with them. They define the syntax and structure of the Python language.

‘Do all the languages have keywords?’ Shilpa asks the teacher.

Ms Arora answers affirmatively, ‘Yes, all computer languages have their own keywords. Python has 33 keywords. Here they are.’

She then lists the keywords.

False	class	finally	is	return
None	continue	for	lambda	try
True	def	from	nonlocal	while
and	del	global	not	with
as	elif	if	or	yield
assert	else	import	pass	
break	except	in	raise	

Fig. 7.8 Keywords of Python

Ms Arora emphasizes that these keywords are case-sensitive and each has a fixed meaning.

Identifier

Ms Arora tells the class that an identifier is a name given to a programming element. It helps in identifying individual elements.

She explains how an identifier should be written.

- An identifier can be any combination of lowercase letters (a–z), uppercase letters (A–Z), digits (0–9), and underscores (_). For example, myVar, kc93, and hello_world are all valid identifiers.
- An identifier name can start with an underscore. For example, _john, _myClass1, and _ket876 are all valid identifiers.
- An identifier cannot begin with a digit. For example, 1var cannot be an identifier, but var1 is a valid identifier.
- Keywords cannot be used as identifiers.
- Special symbols (except underscore), such as $, #, and @, cannot be used in identifiers. For example, ket@js is an invalid identifier.
- An identifier name cannot contain any space.
- Identifier names are case-sensitive.
- Identifiers can be of any length.

Variables

‘Do you know what a variable is?’ Ms Arora asks children.

John recalls what his maths teacher told the class while explaining algebraic expression:

‘The letters used to represent numbers or some other quantities are called literals. As literals can take any value, these are also known as variables.’

Though he has no idea what a variable means in programming, he is quick to reply, ‘Ma’am, a variable can take any value. We learnt in our maths class.’

Ms Arora appreciates John and explains what a variable is in programming:

‘In programming, a variable is a value that can change, depending on the conditions or information passed to the program. When a variable is created, memory space is reserved for it in the computer and data can be stored in this memory space. A name can be given to this memory space to identify it. So, variables are named memory locations used to store data.’

She mentions that the rules for naming a variable are the same as the rules for naming an identifier as the name of a variable is an identifier, and gives some examples of valid variable names:

var, myClass, mySchool, and _ABC

She then tells the class that a variable name should be meaningful. It should emphasize what a variable name means. It makes the program code more readable.

Assigning a Value to a Variable

Ms Arora tells the class that to assign a value to a variable, the assignment operator (=) is used. The general syntax for assigning a value to a variable is as follows:

```
variable_name=value
```

She gives an example:

To store an integer value 10 to a variable named 'var', the statement will be as follows:

```
var=10
```

She writes some more examples on the whiteboard:

name="Rashmi" (Assigning a string value to the variable named 'name')

age=15.12 (Assigning a float-value, that is a decimal value, to the variable named 'age')

Printing the Value of a Variable

The class has now understood that a variable stores a value. Now the question arises—How can the value stored in a variable be displayed on the screen?

Ms Arora tells the class that it is the print statement that is used to display the value stored in a variable. She writes the syntax for the print statement on the whiteboard:

```
>>> print(variableName)
```

She tells the class to remember that if the argument to the print() function is a variable, we do not enclose the variable within quotes.

She now begins writing different lines of code on the Python command prompt and explaining them to the class.

Remember

- The argument to the print statement within quotes is displayed as it is.
- If an argument is written without quotes, then its value is displayed.

1. Assigning some value to a variable *counter* and printing its value:

```
>>> counter=10 (Assigning a value to the variable counter)
>>> print(counter)
```

The output of the above code is as follows.

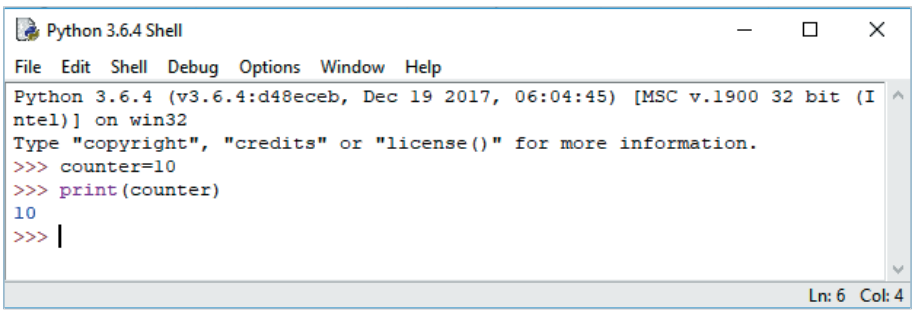

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> counter=10
>>> print(counter)
10
>>>
Ln: 6 Col: 4

Fig. 7.9 Assigning an integer value to a variable

2. Assigning a floating-point value to the variable *floatvar* and then printing its value:

```
>>> floatvar=10.1
>>> print(floatvar)
```

The output of the code is as follows.

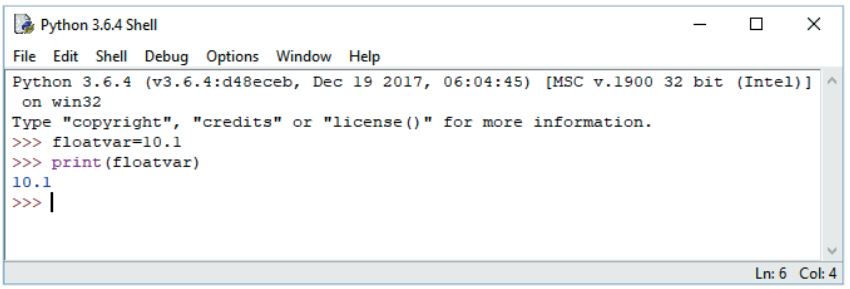

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>> floatvar=10.1
>>> print(floatvar)
10.1
>>>
Ln: 6 Col: 4

Fig. 7.10 Assigning a floating-point value to a variable

3. Assigning a string value to the variable *name* and then printing its value:

```
>>> name="Rahul"
>>> print(name)
```

The output of the above code is as follows.

Quick Learn

Open the Script mode and display your name using the print command. Also, save the program on your desktop.

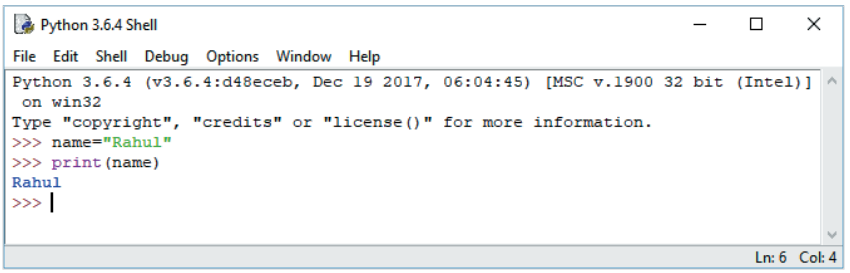

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>> name="Rahul"
>>> print(name)
Rahul
>>>
Ln: 6 Col: 4

Fig. 7.11 Assigning a string value to a variable

Checkpoint

Answer the following questions.

1. What are variables?
2. What will be the output of the following statements?

```
>>>intvar=1
>>>print(intvar+2)
```

3. Explain the data type 'Number' with examples.

Operators

Ms Arora knows that the children are now able to write some basic codes in Python and get the output. In her next class, she decides to explain one more important thing that plays a vital role in a programming language, and these are operators.

She very well knows that the children are familiar with operators and operands in mathematics. She asks the class and gets the right answers:

- An operator is a symbol that represents an action, such as +, –, ×, and ÷.
- An operand is a number on which an operator acts.

Ms Arora lists the types of operators in the programming languages on the whiteboard.

- Arithmetic—used for arithmetic calculations
- Comparison—used for comparing values
- Logical—used in logical calculations
- Assignment operators—used to assign values to variables

Did You Know?

The % operator is called the modulus operator.

Arithmetic Operators

She lists out the common arithmetic operators with the operations they perform.

Operator	Operation	Example
+	Addition	6 + 7 = 13
–	Subtraction	8 – 5 = 3
*	Multiplication	4 * 5 = 20
/	Division	20/4 = 5
%	Remainder	13%2 = 1

Ms Arora then tells one interesting fact about the equal to '=' sign. She explains that in programming, the equal to '=' sign is used to assign a value to the variable.

She tells the class that the order of precedence of the operators remains the same as in maths but without 'of':

1. Parenthesis
2. Division and multiplication
3. Addition and subtraction

Comparison Operators

Ms Arora now lists out the comparison operators used in programming languages. These operators are also called relational operators.

Operator	Operation	Example	Result
>	Greater than	5 > 3	True
<	Less than	3 < 7	True
!=	Not equal to	4 != 4	False
>=	Greater than equal	5 >= 5	True
<=	Less than equal	4 <= 6	False
==	Is equal to	5 == 6	False

Ms Arora tells the class that the is equal to operator '==' is used to compare values. For example, the statement

```
X==3
```

means that 'Is X equal to 3?'.

Logical Operators

Logical operator is something that is new to most of the class. Ms Arora tells the class that a logical operator is used to combine two or more expressions and there are two logical operators—'and' and 'or'. She explains these with examples.

Operator	Description	Example (A=5, B= 10)	Result
and	If both the values are true, the result is true.	A > B and A = B	False
or	If any of the two values is true, the result becomes true.	A < B or A > B	True

Comments

'Let me tell you about comments now,' Ms Arora tells the class.

She explains that a program may contain hundreds or thousands of lines of code. It may sometimes become difficult for others to understand such codes. Programmers use comments to describe large pieces of code.

'A comment is a line of code that is ignored by an interpreter and does not display any output. It is used to give the reader some information about the program or line of code,' she explains.

She tells the class that in Python, a comment begins with the hash symbol (#) and the text following the hash symbol and on the same line as the hash symbol is treated as a comment. If the comment extends over more lines, '#' must be placed in the beginning of each line. She types the following code in the Python prompt command:

```
# This is a comment.
print("Can you see the comment?")
```

She gets the following output.

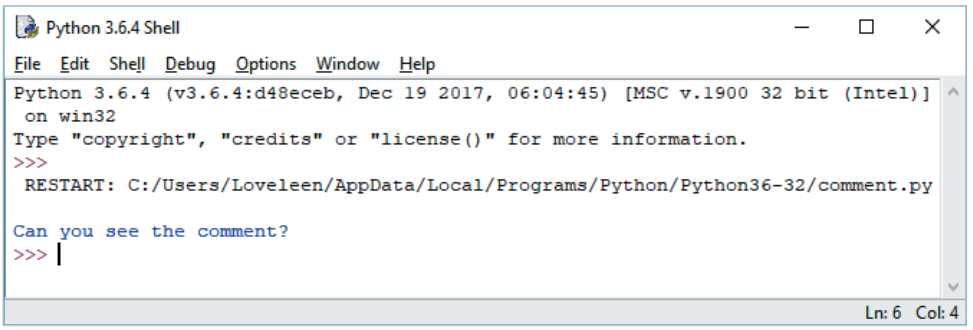

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:/Users/Loveleen/AppData/Local/Programs/Python/Python36-32/comment.py
Can you see the comment?
>>>
Ln: 6 Col: 4

Fig. 7.12 Adding comments

String Concatenation

Ms Arora asks Akanksh to write the following lines of code in the Python prompt command:

```
>>> first_name=“Rahul”
>>> last_name=“Verma”
>>> full_name=first_name + “ ”+last_name
>>> print(full_name)
```

She now asks the class to observe the output, which is displayed to the whole class through a projector.

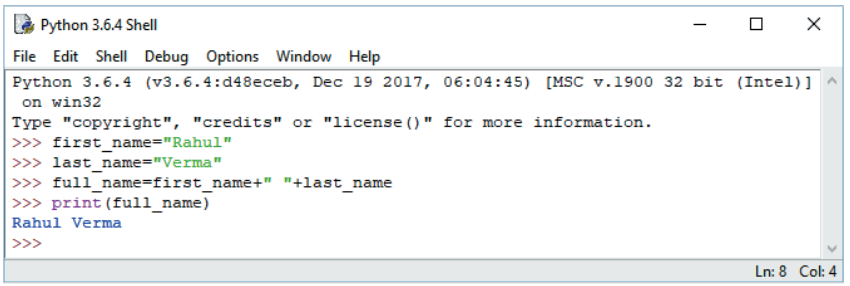

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)]
on win32
Type "copyright", "credits" or "license()" for more information.
>>> first_name="Rahul"
>>> last_name="Verma"
>>> full_name=first_name+" "+last_name
>>> print(full_name)
Rahul Verma
>>>
Ln: 8 Col: 4

Fig. 7.13 String concatenation

‘What have we done here?’ she asks the class.

‘We have combined two words, Rahul and Verma, and got the output as Rahul Verma,’ replies Ravikant.

‘Great, in a program, we often need to add or combine two strings. This is called “string concatenation”. Here we have used the plus (+) sign to concatenate strings,’ she explains.

Well aware that the children might have difficulty in understanding the term ‘concatenation’, she shares its literal meaning to the class:

‘In English, the word “concatenation” means a series of things that are linked together.’

The children are quite happy. They have learnt a new word today.

Now look at the third line of the code again. Can you figure out why a space was included after and before the (+) symbols?

Checkpoint

Fill in the blanks.

1. _____and _____are logical operators in Python.
2. The 'or' operator results _____if any of the values is true.
3. The _____ operator is used to find the remainder.
4. The _____ operator is used to concatenate two strings.
5. A _____is a line of code that is ignored by an interpreter.

Conditional Statements in Python

This is the last class on Python. The class is curious to know what Ms Arora going to deal with now.

She writes this sentence on the whiteboard:

'If it rains, I will wear a raincoat.'

She asks the class what it means and got some interesting answers:

- It shows a condition.
- It shows a situation and a condition.

Ms Arora tells the class that this is a conditional statement. She further explains that in our daily lives we often need to take decisions based on certain conditions.

She tells the class that in computer programs, a conditional statement is a set of rules performed when a condition is met. She then explains the conditional statements used in Python and their syntaxes.

The *if* Statement

The *if* statement evaluates whether a statement is true or false, and it runs only if the condition is true.

Syntax

The syntax of the *if* statement is as shown below:

```
if expression:
    statement(s)
```

The *if…else* Statement

The *if…else* statement has two 'blocks'. One is the *if* block, which is the same as above, and the other is the *else* block. If the expression in the *if* block evaluates to FALSE, it executes the code in the *else* block.

Syntax

```
if expression:
   statements
else:
   statements
```

The *If…elif…else* Statement

This statement is used to handle several conditions together. (elif is like saying 'else if'). There can be multiple *elif* blocks, but there can only be one *if* and *else* block in this type of statement.

Syntax

```
if expression:
   statements
elif expression2:
   statements
else:
   statements
```

Writing Programs to Use Conditional Statements

Ms Arora now writes a simple program to use the *if* statement.

```
num=10
if num%2==0:
   print("It is an even number.")
```

She reiterates to the class that we should write a program in the script mode, save it, and then run it to see the output. Here is the output of this program.

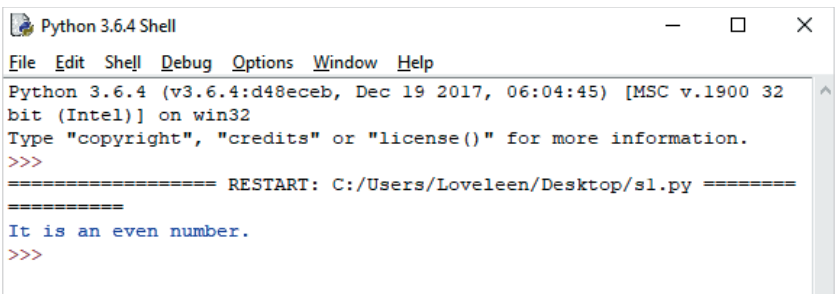

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:/Users/Loveleen/Desktop/s1.py ==========
It is an even number.
>>>

Fig. 7.14 Output of the previous program

Ms Arora asks the children to write the following program in the script mode:

```
num=5
if num%2==0:
```

```
        print(“It is an even number.”)
    else:
        print(“It is an odd number.”)
```

The output of the program is as follows.

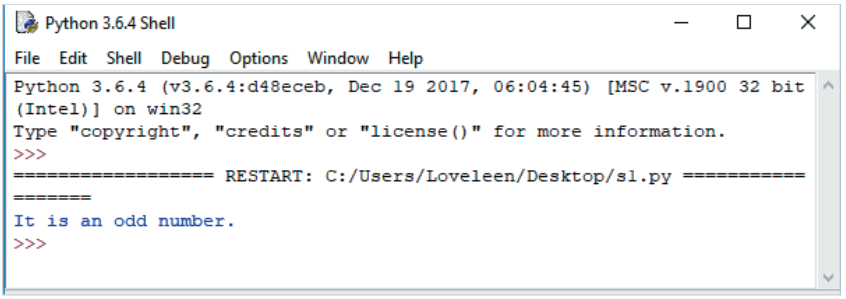

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:/Users/Loveleen/Desktop/s1.py ==========
It is an odd number.
>>>

Fig. 7.15 Output of the previous program

Ms Arora gives the class this simple assignment, which displays the use of *If…elif…else* statement.

Write a program to print the grades of a student according to her marks.

```
marks=78
if marks>=80:
    print(“Your grade is ‘A’.”)
elif marks<80 and marks>=70:
    print(“Your grade is ‘B’.”)
elif marks<70 and marks>=60:
    print(“Your grade is ‘C’.”)
else:
    print(“Your grade is ‘D’.”)
```

Quick Learn

Open the Script mode and write a program to display the smallest of the numbers 30, 10, and 50.

She helps the children in writing the program. The output displayed is as follows.

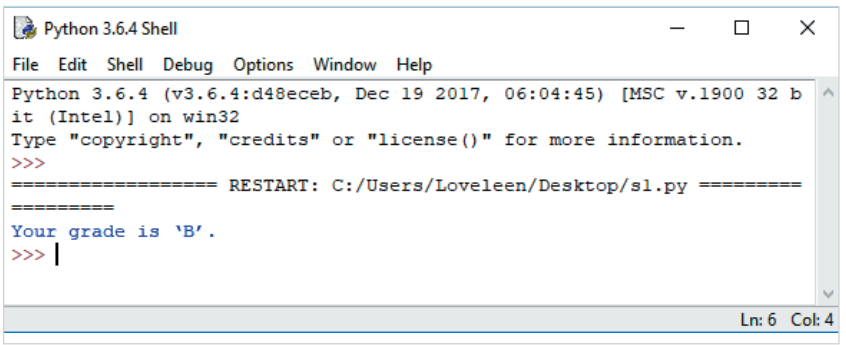

Python 3.6.4 Shell
File Edit Shell Debug Options Window Help
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:/Users/Loveleen/Desktop/s1.py ==========
Your grade is 'B'.
>>>
Ln: 6 Col: 4

Fig. 7.16 Output of the previous program

John is on cloud nine. He has now been introduced to a programming language, which he finds fascinating. He is ready to explore the world of programming languages.

Key Terms

Programming language	Set of words, symbols, commands, and rules used to write instructions for a computer or a software program
High-level language	Computer language that uses the words in the English language
Interpreter	Software program that executes a program code line by line
Data type	Classification of the type of data
Keyword	Reserved word that has a special meaning associated with it
Identifier	Name given to objects like functions, variables, classes, or modules in Python
Variable	Named memory location used to store data
Operators	Symbols used in an expression to specify the operation to be performed
Operands	Values on which the operators act
Comments	Instructions that are ignored by an interpreter
String concatenation	Way of combining two or more strings

Recap

- Python is a high-level programming language. It is an easy-to-understand, simple, open-source, portable, easy-to-learn, object-oriented, and embeddable programming language.
- Python's package provides an integrated development and learning environment (IDLE) to write and run Python programs.
- There are two modes in IDLE—interactive and script.
- Python files are saved with '.py' file extensions.
- The data types available in Python are numbers, lists, dictionary tuples, and strings.
- There are three main elements of Python—keywords, identifiers, and variables.
- There are in total 33 keywords in Python.
- Operators are used to carry out calculations in Python. There are three types of operators—arithmetic, logical, and comparison.
- The hash symbol (#) is used to add comments in Python, and the plus operator (+) is used to concatenate two strings.
- There are three types of conditional statements that are used in Python—if, if…else, and if..elif…else.

Exercise

A. Choose the correct options.

1. Which of the following is a valid identifier?

   a) Machine b) 12Assem c) High^%level d) ##Java

2. Under which category of operators does the modulus operator fall?

   a) Arithmetic b) Comparison c) Logical d) Number

3. Which of the following is a valid keyword?

   a) when b) finally c) error d) delete

4. Which of the following symbols is used to add comments in Python?

   a) * b) # c) + d) $

5. Which of the following statements represents a string concatenation?

   a) str3=str1–str2 b) str3=str1*str2

   c) str3=str1+str2 d) str3=str1/str2

B. State *true* or *false*.

1. Python is a compiled language.
2. Keywords are case-sensitive.
3. Python is an open-source programming language.
4. Number data types include integer as well as floating-point values.
5. The precedence of addition is higher than multiplication.

C. Fill in the blanks.

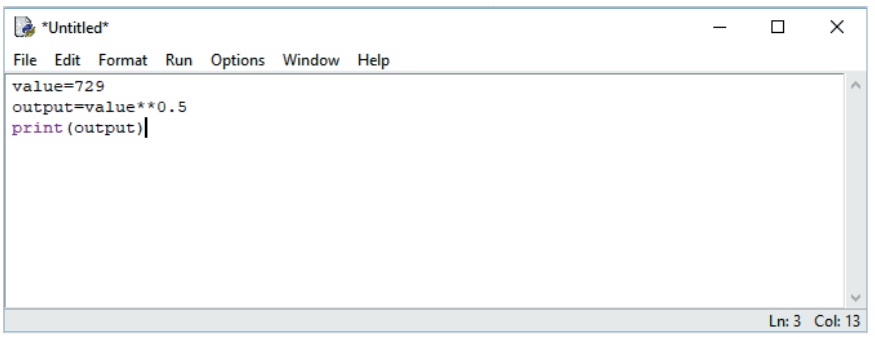
1. The _____ converts a high-level language to a low-level language line by line.
2. The _____and _____ are the two modes of Python IDLE.
3. The programs written in Python can be saved in the _____mode.
4. The Python files are saved with _____extension.
5. The _____operators are also called the relational operators.

D. Answer the following questions.

1. Describe the difference between keywords and identifiers.
2. List down the rules for naming an identifier.
3. How can you assign a floating-point value to a variable? Write an example.
4. Explain the data types available in Python.
5. Explain some different types of operators used in Python.
6. What are conditional statements? Explain with examples.

Application-based Questions

1. Consider the code shown below. What will be the output of the program?



2. Consider the given statements, and write the output.

```
value1=5
value2=7
if(value1==value2):
   print(value2+5)
else:
   print(value1+4)
```

3. Rakesh is writing a program. Help him to identify valid variable names and correct the invalid ones. Variables are:

   a) Father'sName b) date of birth c) 1SubMarks d) Sub2Marks
   e) Sub3_Marks f) Total_marks g) Percentage h) Grade i) RollNo.

4. Misha has written the given program in Python. She wants to run the program and see the output. But when she clicks on the run command, some errors occur. Help her in rectifying the errors.

```
num_a=8
num_b=9
num_c=10
```

```
if(num_a>=num_b) and (num_a>=num_c)
   largest=num_a
elif(num_b>=num_a) and (num_b>=num_c)
   largest=num_b
else
   largest=num_c
Print(The largest number between, num_a, “,” num_b, “and”, num_c,
“is”, largest)
```

Lab Activity

1. Write the programs for the following in the interactive mode:
   a) Add the numbers 10, 11, and 26.
   b) Find the difference between the numbers 90 and 57.
   c) Find the square of the number 19.
2. Write a program to find the following:
   a) The area and perimeter of a rectangle whose length = 15 and breadth = 6
   b) Area of a triangle with base = 25 and height = 12
3. Write a program to find simple interest if principal = ₹1,50,000, rate = 5%, and time = 7 years.

$$\left[\text{Simple interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}\right]$$

4. Write a Python program to convert 178 Indian rupees to US dollars. (Use 1 Indian rupee = 0.015 USD.)
5. Write a Python program to create a variable ‘temp’, and assign it some temperature in Celsius. Display the message ‘It’s very hot today!’ if the temperature is greater than 40º; otherwise, display ‘It’s not too hot!’.
6. Write a Python program to assign a value to percentage. Print ‘Pass’ if percentage is greater than 50, otherwise print ‘Must work hard’.
7. Write a Python program to check whether a number is positive, negative, or zero, and display an appropriate message. (Display ‘positive’ if the number is greater than 0, ‘negative’ if the number is less than 0, and ‘zero’ if the number is equal to 0.)

Project

1. Collect the marks of ten of your friends in mathematics. Now write a program in Python to calculate and display the average marks. Now compare your marks with the average marks and display the message ‘I got grade A’ if your marks are greater than the average marks; otherwise, display ‘I got grade B’.
2. Note down the temperatures of a city for 15 days in the month of June in Celsius. Now write a program in Python and calculate the average temperature, and convert it to Fahrenheit. (Use $F = C*9/5+32$.) What would happen if you use the formula ‘$F = C*$ (9/5) + 32’? Will the answers be the same? If they are not the same, why not, and which one is correct?

Explore More

Conduct a research on ‘bitwise’ operator. Write examples to show how they are used.

Weblinks

- https://www.geeksforgeeks.org/py-facts-10-interesting-facts-about-python/
- https://www.tutorialspoint.com/python/nested_if_statements_in_python.htm

Work Wisely

- Never use keywords for other purposes because they have a fixed meaning.
- Always use comments in your programs for better readability. It helps other programmers too who read your program.

Notes for the Teacher

- Demonstrate the steps to download and install Python.
- Help students learn the difference between keywords and identifiers.
- Give appropriate examples to explain operators and conditional statements.

8 Internet Services

After going through this chapter, you will be able to—

- **use** the internet to enhance learning;
- **list** the differences between the internet and WWW; and
- **acknowledge** the benefits of e-learning.

Monika is fond of using the internet. She uses it for finding useful information on various subjects. At the same time, she ensures that she does not spend too much time on the internet.

It is Sunday. Monika is quite happy. Her cousin, Ishita, has come to meet her. Ishita is a software professional and Monika wants to know all about the internet from her.

Ishita tells Monika, 'Use the internet to keep your learning curve steep.'

'What does this mean?' Monika asks.

'Check the internet,' Ishita replies.

Monika checks the online dictionary and finds its meaning:

'the rate at which you learn something new'

'How did the internet come into being Ishita? Who invented it?' she wondered.

'It is the result of the efforts of a number of scientists, programmers, and engineers,' Ishita tells Monika.

Monika is keen to learn about the history of the internet. Ishita takes her through the fascinating journey of how basic internet services have evolved and how they are helping in shaping the modern world. She tells Monika that the word 'internet' comes from **inter-**, meaning 'between' and **network**, meaning a number of computers connected together. It came into being in the 1970s denoting a computer network connecting two or more smaller networks.

Ishita now shares this story with Monika:

In the late 1960s, the US Department of Defense wanted to develop a system through which information can be shared over large distances without any phone connection. J. C. R. Licklider, an American computer scientist, then developed a network of computers, known as ARPANET (Advanced Research Projects Administration Network).

It used the concept of packet switching. Packet switching is a method of breaking large messages into smaller pieces to make them suitable for sending to large distances. Each packet is a small part of the large message. Soon the engineers, scientists, students and researchers started sharing resources.

Monika now asks, 'What happens next?'

Ishita then explains that later certain rules of data transmission between multiple networks, known as protocol, were defined by two engineers Robert Kahn and Vinton Cerf in the 1970s. These rules are named the transmission control protocol/internet protocol (TCP/IP) by them.

'In the mid-80's, the National Science Foundation, an agency of the US government, created a new high-capacity network called NSFnet for academic research,' Ishita tells Monika.

She further explains to her how the foundation of the internet was built. She tells Monika that thereafter many private companies built their own networks, which were later interconnected along with ARPANET and NSFnet to form the internet.

Monika has now understood that the internet is a global network of computers. Ishita tells her that it is also called the 'network of networks'. Nowadays, it is also called the 'net'.

World Wide Web

'Let me now tell you about the WWW,' Ishita tells Monika.

'What's that?' Monika asks Ishita.

Ishita explains that the internet is a global network of networks, while the World Wide Web is a system for finding information on the internet.

'Who invented it?' comes Monika's question.

Ishita replies, 'The World Wide Web was invented by Tim Berners-Lee, a British computer scientist, in 1991.'

Remember

The internet should not be confused with WWW. The internet is a network of interconnected computers, while the WWW is a system of interlinked documents on the internet.

Monika has now understood that while the internet is simply a network of many computers, the World Wide Web is one of the platforms used to exchange data and information over the internet. Ishita has also told her that the World Wide Web is also simply known as the Web. Now she wants to know how the Web works.

Ishita tells her that in the WWW, related documents are connected to one another through electronic connections, and this linking is called **hypertext**. She tells Monika that a document connected to the WWW is called a web page, and the hypertext transfer protocol (http) is the set of rules that control the way data is sent and received on the World Wide Web.

She wants to show Monika a web page. But before opening it, she tells her that we need a browser to open a web page and browsers are the tools to use the WWW.

Did You Know?

Email is also used to exchange data information, but it is one of the services of the internet.

'What do you want to search for?' Ishita asks Monika.

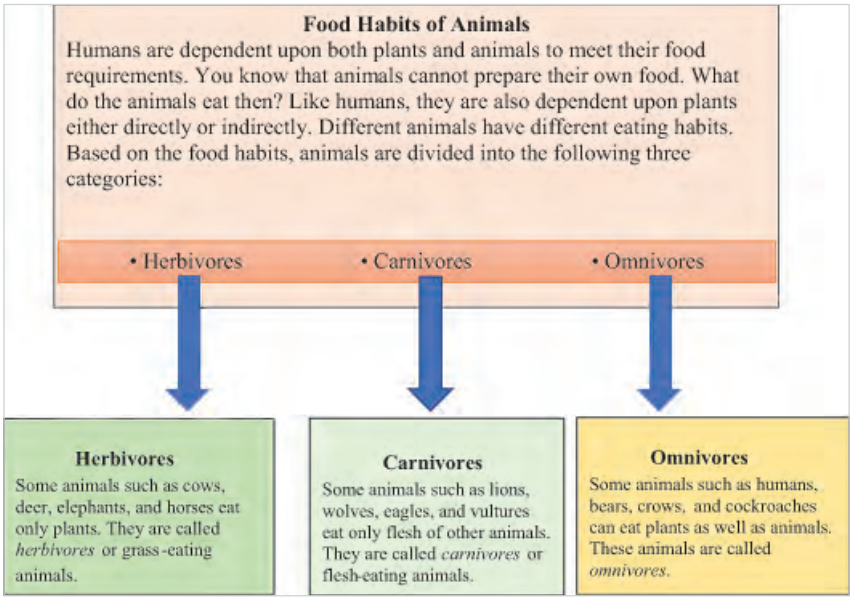
'I would like to learn about food habits of animals,' she replies.

Now we need a search engine where we can type what information we need.

'See, Monika, this is a search engine for kids,' Ishita says. She tells Monika to always use the search engines meant for kids for searching information.

Ishita now uses a web browser, opens a search engine meant for kids, and types 'food habits of animals' thereon. A web page containing the information on food habits of animals opens.

Monika notices herbivores, carnivores, and omnivores underlined there. Ishita tells her that these are hypertext links. She asks Monika to press Ctrl + click on these links. On clicking on a link, a new document opens.


Food Habits of Animals
Humans are dependent upon both plants and animals to meet their food requirements. You know that animals cannot prepare their own food. What do the animals eat then? Like humans, they are also dependent upon plants either directly or indirectly. Different animals have different eating habits. Based on the food habits, animals are divided into the following three categories:
• Herbivores
• Carnivores
• Omnivores
Herbivores
Some animals such as cows, deer, elephants, and horses eat only plants. They are called herbivores or grass-eating animals.
Carnivores
Some animals such as lions, wolves, eagles, and vultures eat only flesh of other animals. They are called carnivores or flesh-eating animals.
Omnivores
Some animals such as humans, bears, crows, and cockroaches can eat plants as well as animals. These animals are called omnivores.

Ishita tells Monika that there is a computer language, known as hypertext markup language (HTML), that is used to create the documents of the web.

E-learning

'Do you know where we have found the information on food habits of animals?' Ishita asks Monika.

'Yes, on the internet and on a website,' Monika replies.

'It is an e-learning website for kids,' Ishita says.

Ishita then explains to Monika that e-learning is a method of delivering educational content through electronic medium, especially the internet, anywhere in the world.

Ishita emphasizes that with e-learning, it is now possible to deliver content to those places where access to classrooms is not feasible. E-learning is now being widely adopted by many educational organizations for teaching various courses. It is also helpful for experiencing concepts that are not possible in a traditional classroom. Ishita mentions some examples of visualizing concepts at a microscopic level through videos or animations—molecular structure, eruption of a volcano, and mechanics of a tsunami.

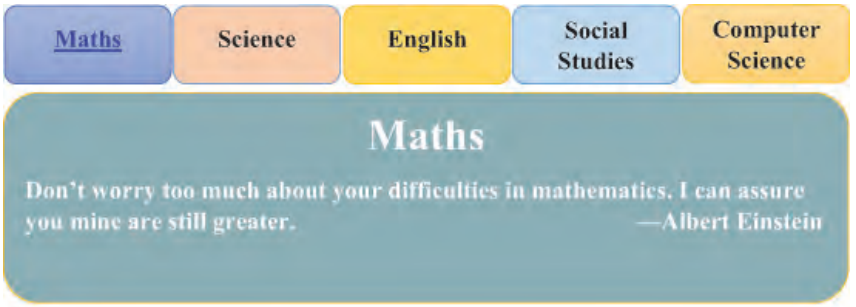
Did You Know?

URL is the abbreviation of Uniform Resource Locator and is defined as the global address of documents and other resources on the World Wide Web.

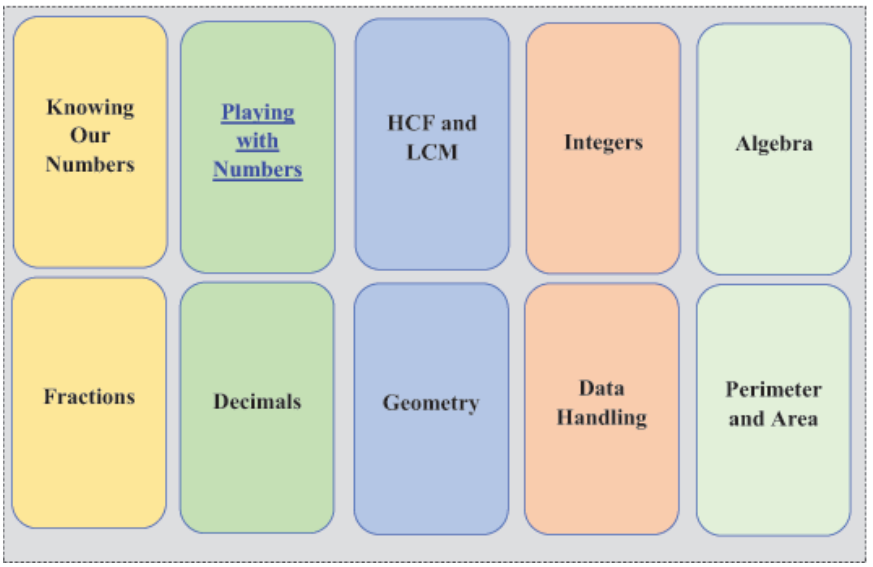
‘But I go to school for learning. How is e-learning beneficial for me?’ Monika asks.

‘Let me show you,’ Ishita opens an e-learning website meant especially for kids. She shows different subjects listed there.

Ishita asks Monika to click on any one subject. She clicks on Maths and then on grade 6.



Monika notices different lessons of maths for a grade 6 kid on the screen.



Monika clicks on the topic ‘Playing with Numbers’ and starts the lesson.

The lesson starts with an interesting video on the topic.

What have you learnt?' Ishita asks Monika.

'I have learnt about the divisibility rules,' says Monika enthusiastically.

'Tell me if the number 5,43,14,172 is divisible by 11,' Ishita asks Monika.

Monika has become more confident now.

'Here you go,' she says and solves the sum in her exercise book.

The sum of the digits at even places = 5 + 3 + 4 + 7 = 19

The sum of the digits at odd places = 4 + 1 + 1 + 2 = 8

Difference = 19 – 8 = 11, divisible by 11

Hence, the number 5,43,14,172 is divisible by 11.

Ishita is happy. Her guidance has paid off, and Monika has assured her that she will use the internet and e-learning services to enhance her learning.

Ishita has left with a beautiful message for Monika, 'Education means learning and always developing our skills. Learn music, dance, art and craft, languages, or any other skill you want to cultivate.'

Monika thanks Ishita.

'Bye Monika, Let's meet on Skype tomorrow evening,' says Ishita.

'Skype, what's that?' wondered Monika.

This time, Ishita's mother assures her, 'Don't worry. I will tell you about that.'

Ishita leaves and Monika thanks her again.

Checkpoint

Choose the correct options.

1. Which of the following is used to surf the Web?
   a) Browser b) Surfer c) Mailer d) None of these
2. Which protocol does the World Wide Web use?
   a) TCP/IP b) IGMP c) HTTP d) UDP
3. In which year did the WWW reshape the internet?
   a) 1990 b) 1991 c) 1994 d) 1997

Videoconferencing

It's Monday evening. Monika has done her homework. She went to play with her friends and is back home now. She is waiting for the 'Skype thing' about which Ishita told her.

It's her mother's turn to introduce her to this new thing.

Her mother opens Skype on her computer. She tells Monika that they must be registered with it to use it. She then signs into her Skype account.

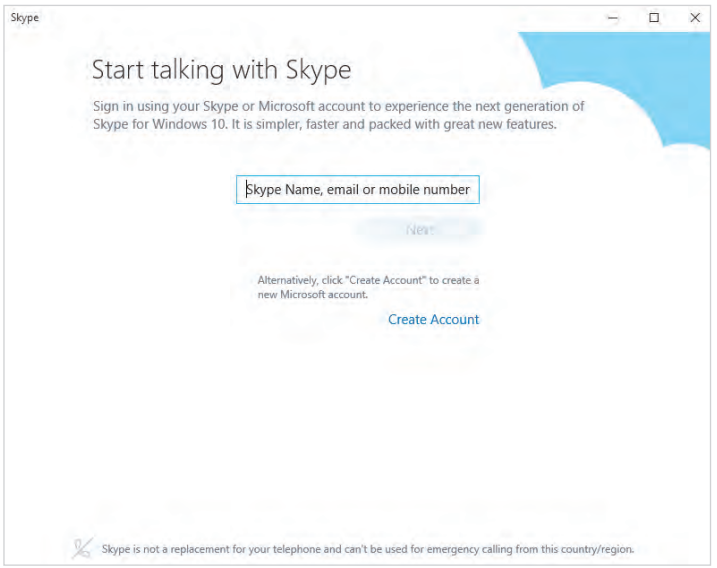

Skype
Start talking with Skype
Sign in using your Skype or Microsoft account to experience the next generation of Skype for Windows 10. It is simpler, faster and packed with great new features.
Skype Name, email or mobile number
Next
Alternatively, click "Create Account" to create a new Microsoft account.
Create Account
Skype is not a replacement for your telephone and can't be used for emergency calling from this country/region.

Fig. 8.1 Signing in to Skype

Remember

Skype comes preinstalled with Windows 10.

After signing in, Monika's mother clicks on Ishita's name in the online contacts. Then she clicks on the Video call icon to start a video call.

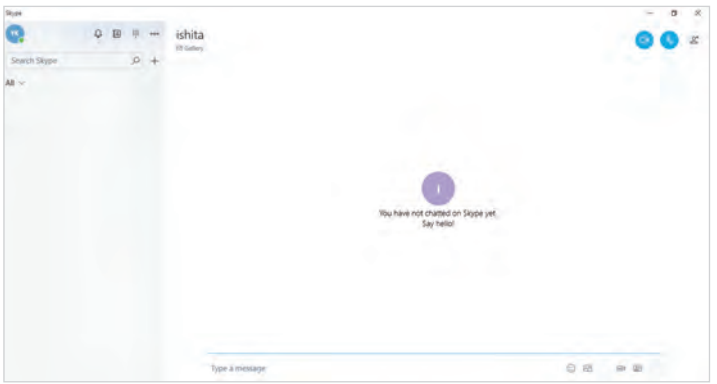


Fig. 8.2 Starting a video call

Did You Know?

WhatsApp messenger is a service that lets you send messages, make voice and video calls. It also lets you send images, video clips, and other media documents.

Monika is thrilled. She talks to Ishita on various topics. She wants to know how she can learn vedic maths using the internet. Ishita is happy that Monika is exploring the internet to hone her skills. She tells her the way to check the e-learning websites that teach vedic maths.

Ishita also tells Monika that the method through which they are talking is videoconferencing. She further tells her that there are various ways of doing videoconferencing and Skype is one of them.

Monika is happy to have learnt something new. She has also remembered the last and the most important things that Ishita has told her:

- We should use videoconferencing only to connect with our family and friends.
- Never accept any videoconferencing requests from strangers.
- Never engage in a video call with strangers.

E-banking

Monika has now started observing her mother using the internet in various ways. She often observes her using her mobile in paying various bills, such as of electricity and DTH. Her mother tells her that this is called e-banking, online banking, or internet banking. She further elaborates that e-banking is one of the major revolutions that computer technology and the internet has set in motion.

'Nowadays, we don't have to carry cash Monika's mother tells her.

'But I always take care to use secured sites while doing online banking,' she further tells Monika.

Netiquette

Monika has now become familiar with some popular internet services. While she is thrilled on learning about these, her mother decides to tell her important points to be kept in mind while using these. She tells Monika that it is very important to learn the correct ways of working on the internet.

'The correct ways of using the internet are also known as netiquette,' she tells Monika and starts elaborating them.

- Avoid sharing your personal information.
- Respect other's privacy and do not post their personal information.
- Send emails to the intended recipients only.
- While searching on the internet, read the information that you get carefully before using it. Cross-check the information when in doubt with your elders or teachers.
- Avoid copying information directly from a web page.
- Avoid giving your details on a website. Always go to your elders if a website is asking you for your personal details.
- Look for the web addresses that are denoted with 'https' as they are more secured. In 'https', the letter 's' stands for 'secured'.

Last but not least, Monika's mother tells her that there are various search engines designed especially for kids and she should use them.

Key Terms

HTML	A markup language for creating web documents
internet	A global network of interconnected computers
WWW	A platform that enables exchange of information over the internet
E-learning	Specific courses provided over the internet
E-commerce	An activity of buying and selling items online
E-banking	Doing bank transactions online
Videoconferencing	An activity where multiple users at different locations attend a live visual call at the same time

Recap

- The internet is a global network of interconnected computers that uses the TCP/IP protocol to transmit data.
- ARPANET was the first prototype of the internet introduced in the late 1960s.
- The internet became popular after the launch of the World Wide Web in 1991.
- The World Wide Web, invented by Tim Berners-Lee, enables exchange of information over the internet via HTTP.
- E-learning is an activity of learning courses available on the internet.
- Videoconferencing is a facility through which multiple users from different locations communicate with each other at the same time using audio and video.
- Skype is a multipurpose telecommunication software application that includes voice calling, video calling, instant messaging, file sharing, video conferencing, and text messaging.

Exercise

A. Choose the correct options.

1. Who put forth the idea of computer networks?
   a) Tim Berners-Lee b) J. C. R. Licklider c) Charles Babbage d) None
2. Which of the following is a globally connected network of computers that transmit data via TCP/IP?
   a) WWW b) Computer network c) The internet d) Global network
3. Who introduced TCP/IP?
   a) Robert Kahn b) Vinton Cerf c) Both a) and b) d) Tim Berners-Lee
4. Which of the following protocols controls the way data is sent and received on the World Wide Web?
   a) HTTP b) HTML c) TCP/IP d) All of these
5. Which of the following is a videoconferencing platform?
   a) Cricbuzz b) Twitter c) Skype d) None of these

B. State *true* or *false*.

1. ARPANET was the first internet prototype.
2. Videoconferencing is used to make only audio calls.

3. Banks allow online banking on fixed days.
4. E-learning helps students learn via the internet.
5. HTTP is the language used to create web pages.
6. We can do videoconferencing with only five members on Skype.

C. Fill in the blanks.

1. The related documents on WWW are connected to one another through electronic linking called _____.
2. _____ is the practice of buying and selling things online.
3. The internet is a global network of _____.
4. _____ is a markup language for creating web documents.
5. ARPANET adopted TCP/IP in the year _____.

D. Answer the following questions.

1. What do you understand by the term 'internet'?
2. Write briefly about the history of the internet.
3. Explain the World Wide Web.
4. What is e-learning? What are its advantages?
5. What is e-commerce? Give some examples of e-commerce websites.
6. Define e-banking. Name some banks that provide e-banking facilities.
7. Write a short note on videoconferencing. Name any three videoconferencing platforms.

Application-based Questions

1. IntrSys company has its offices in Bangalore, Delhi, and Kolkata. The sales people from all the locations want to have a meeting regarding the upcoming products. How can they all attend a meeting being at different locations?
2. Sneha has to deposit her fees. How can she do this without going to the bank?
3. Ravi met with an accident and the doctor advised him not to go outside. But Ravi wants to learn Java. What should he do?
4. Niharika needs to create a presentation on 'Germination of seeds'. How can the Web help her? What precautions should she take, if any?

Lab Activity

1. Open a web browser, such as Google Chrome and Internet Explorer, and follow these steps:
   a) Open the first website that was launched—http://info.cern.ch.
   b) Right-click anywhere on the website screen.

c) Choose View Page Source.
d) You will see the basic HTML code there.

2. Open a web browser and follow these steps:
   a) Open the website https://www.khanacademy.org.
   b) Click on “Learners, start here”.
   c) Select the subject and topic.
   d) Browse the content.

Project

1. Make a poster in Word/PowerPoint on online safety.
2. Divide the class in groups. Each group will make a presentation on different internet services, their advantages and disadvantages and present it in front of the class.

Explore More

- Study the security concerns regarding e-banking.
- Find some information about the first videoconferencing platform.

Weblinks

- https://bonlinelearning.com.au/publications/e-Commerce%20and%20e-Learning.pdf
- https://en.wikipedia.org/wiki/Online_banking

Work Wisely

- Follow SMART Rules to stay safe online. Keep your personal information **S**ecret. Be cautious while meeting with cyber friends. Accept files from reliable sources only. Check the reliability of information. Tell your parents or trusted adults if someone is bullying you or asking for personal information.
- Tell your elders to never share their e-banking password with anyone not even the bank employees.
- Always keep your browser updated because every update brings new security features.

Notes for the Teacher

- Help students understand the internet and the World Wide Web.
- Help them understand the advantages and disadvantages of e-commerce and e-banking.
- Help them to be safe online.
- Help them understand the potential for learning on the web.
- Arrange a videoconferencing with a partner school.
- Divide the class into groups. Ask them to create presentations on the advantages of the Web in supplementing and complementing learning, and how they can use the Web to support their studies.

Worksheet 1

A. Choose the correct options.

1. Which of these software programs translates one line of code at a time?

   a) Disassembler b) Compiler c) Interpreter d) Browser

2. Which of the following tools lets you select areas of similar colours in GIMP?

   a) Ellipse Select b) Fuzzy Select c) Rectangular Select d) Pencil

3. Which of these would you choose to make an audio clip run again and again?

   a) Trim Audio b) Loop until stopped

   c) Record audio d) Playback tool

4. In Excel, by default, the row height and column width are _____ and _____ respectively.

   a) 12.75 points and 8.43 characters

   b) 13.75 points and 9.43 characters

   c) 12.95 points and 8.53 characters

   d) 12.75 points and 9.43 characters

5. Which of these features can be added to show how one slide moves to another slide?

   a) Transition b) Sound c) Duration d) All of these

B. Differentiate between the following:

1. Assembly language and 4GL
2. Compiler and interpreter
3. Column and line charts

C. Name the tab and group where you can find the following commands in PowerPoint.

Tasks	Tab	Group
Add an audio clip		
Control how a video clip plays		
Rehearse transitions for slides		
Record audio for a slide		
Embed content from an Excel file in a slide		

Practical Assignments

1. You are assigned to make a budget for your birthday party. Make a worksheet in MS Excel giving all details of the party as follows:
   a) There should be rows for different headings of expenses, such as food expenses, music, rent for the venue, travelling, cake, return presents, invitation cards, and thank-you cards.
   b) Add another sheet with details of each guest.
   c) Save the workbook as *My Birthday Planner*.
2. Write a program in Python to assign your name, your father's name, address, Mobile No., date of birth, and blood group to different variables and then print the values in the form of the school I-card.

Worksheet 2

A. Choose the correct options.

1. Mona wants to view some specific information in a spreadsheet. What should she do?

   a) Sort data b) Filter data c) Remove a filter d) Apply borders

2. Which of the following is a valid variable name in Python?

   a) 4AB b) 1AB c) _AB d) AB&

3. Which of the following is an image editing software program?

   a) Python b) PowerPoint c) GIMP d) None of these

4. Which of the following statements is not correct?

   a) The function print() is a predefined function in Python that starts with the lowercase ‘p’.

   b) The data type ‘string’ stores a combination of letters within quotation marks.

   c) Keywords can be used as identifiers.

   d) An identifier cannot begin with a digit.

5. Which of the following is not a function of an operating system?

   a) Managing input and output devices

   b) Performing arithmetic calculations

   c) Managing different processes

   d) Providing user with a medium to interact with the computer

B. Differentiate between the following.

1. Conditional formatting and AutoFilter
2. WWW and internet
3. Bucket Fill tool and Paintbrush tool

C. Match the columns.

	Column A		Column B
1.	Packet switching	a)	A programming element
2.	Rehearse Timing	b)	Mozilla
3.	Identifier	c)	Image editing software
4.	GIMP	d)	Breaking large messages into smaller pieces
5.	Web browser	e)	Slide Show tab

D. Observe the given figure and number the commands used to perform the given tasks.

1. To place a picture from a file on your slide
2. To place a callout on your slide
3. To record your voice and add it to the slide
4. To add a video on your slide

Practical Assignments

1. Write an algorithm and draw a flow chart to print whether the number is even or odd.
2. Write a Python program to print all the odd numbers between 10 and 40.